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GEORGE WESTINGHOUSE.

In the death of George Westinghouse, on March 12, there passes a truly great man. He was not only an inventor of versatility and possessed of the most prolific genius for the development of new ideas, but he was indeed a creator of new conditions and a builder of industry. Not only did he contribute to the solution of engineering problems which have brought about the greatest advances in civilization, but he also, through his mastery of material and resources, developed great organizations for the economic production of these necessary and needed utilities.

Mr Westinghouse lived a wonderful life in a wonderful age, and his achievements are all the more noteworthy because they form so conspicuous a part of the greatest development that has been known in the history of the world. While a great many of his most notable inventions were singular and apart from other epoch-making inventions discovered by other men, it was a part of this great man's foresight and rugged pertinacity to see in his own creations the ultimate possibility of merging into the coherent development of an enlightened civilization.

With all his greatness as an inventor and as a master of industry, the human side of the man appears never to have been repressed. He was just as notable for his pioneering in welfare work on behalf of those who labored for and with him as he was for other more material and spectacular accomplishments. He was the good friend and kindly counsellor for hosts of minor inventors, and he was ever on the alert to do a good turn for a legion of friends. As an employer his name is revered, and not only among the 50,000 odd occupied in the vast industries connected with his name, but throughout whole communities where his influence for good was felt and his example of fair treatment emulated.

It is difficult indeed to sum up the measure in which he was entitled to the world's encomiums. Probably few men knew him or understood him better than Arthur Warren, and hardly anyone could express a more fitting tribute, so it is with gratitude that we are able to quote from a letter by Mr. Warren, published in the *Evening Post,* of New York, the following paragraph:

"It is not easy to name his dominant trait or faculty. Some will say it was initiative, others that it was fearlessness, others persistence, and many will say it was foresight. All these he possessed, and that indefinable power which is genius. He was

radio-active, ceaselessly giving out energy, yet parting with none. He seemed tireless though he worked incessantly. Big-bodied, big-brained, kind-hearted, sincere, he looked what he was—an incarnation of power. When he willed a course of action, the act was as good as done; when he spoke, his word was taken because it was his word. His integrity was superb. He was no speculator or gambler; he never juggled with stocks, never manipulated markets. In financial quarters it was sometimes said that he was no financier. But it is known now that the recent reorganization of the Electric Company, which he founded, was due to the adoption of a plan which he originated and which he carried through successfully with full protection to creditors and stockholders and without interruption to the work of the thousands of employees. His plan was carried in preference to those recommended by eminent financiers. Its success has caused it to be looked upon as a remarkable constructive achievement in finance."

THE REGULATION OF PUBLIC UTILITIES.

Whether it be for good or evil, the regulation of public utilities by some form of commission is with us. No matter what the reason for the evolution, no matter what the conditions which led up to the demand for this control of public utilities, the commission in some form or other in many states now forms a most important and indeed vital part of public utility opportunity.

The necessity for or the wisdom of public utility regulation of this character, and the hazard of ineffectiveness always present may be questioned. There would be little satisfaction, however, if the whole proposition should prove to be wrong, in view of the distress that must accompany such a consummation. In order that the greatest success may obtain in the development of public utilities under sane regulation and control, every element involved must be educated. The dissemination of information respecting the news of utility commissions, the close analysis and commentary upon the hearings and opinions of these commissions, and the thorough exposition of the debatable points which lead to a clarifying of every situation are essential.

In order that the readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN may be served to the best advantage in this respect we have arranged with Mr. William J. Norton to conduct the department of this publication devoted to matters relating to public service commission news and the regulation of public utilities. Mr. Norton is preëminently qualified to act for our readers in this capacity. He has been intimately connected with the study of rates and regulations, and the methods of procedure and characteristic attitude of mind of public service commissions ever since their inception. He was assistant secretary of the Public Service Commission of the First District of New York. He was first secretary of the Rate Research Committee of the National Electric Light Association, and editor of *Rate Research*, the notable bulletin upon this subject published by that committee, and he is also author of the publication entitled "The Illinois Public Utility Law."

In this department of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN we will present all items of news respecting the work of the various commissions. In this way the public-utility operators will be kept informed by the highest authority available today. Of the greatest value, however, to the public-utility operators will be Mr. Norton's contribution in analyzing the various decisions and commenting upon the debatable points as they affect a constructive building up of a proper public service regulation. Notable in this connection is the article entitled "Competition in New Jersey," referred to below.

In this article, published on other pages of this issue, Mr. Norton presents a clear and frank summary of the decisions respecting competition in the public-utility field as rendered by commissions in earlier hearings. It is of great importance in viewing the progress of regulation broadly that the bases for the establishment of these precedents be considered carefully. It is therefore suggested that the central-station manager bring this analysis and commentary to the attention of every element at interest, both inside and outside of his organization, so that there may be a complete understanding of the relations involved.

Our readers are invited to give to this department their strict attention. We will be glad to have suggestions and Mr. Norton will answer questions relating to this subject that may be propounded by our readers.

COMPETITION IN NEW JERSEY.

Perhaps no subject is of as vital interest to the central stations in the United States, as the matter of protection from competition from the various public service commission laws.

The complete laws of such states as Massachusetts, Wisconsin, New York, New Jersey and Indiana leave very little to be desired as model pieces of legislation, dealing fairly with the utilities, and based upon sound economics.

It is gratifying that in general the commissions have thoroughly recognized the responsibility of enforcing such laws without fear and without favor, and the compilation of such decisions as we print in this issue shows the thorough mastery by the old commissions of this important part of commission regulation.

Such laws as those of Oklahoma, Illinois and Missouri are clearly defective in that the commission is given no power over duplication of utility property if the duplication is made by the municipality itself. It is to be hoped that these states will amend their laws so that commissions are given complete juris-

diction in the determination of whether or not convenience and necessity require a duplication of utility property.

It is with regret that we notice that the New Jersey Commission, whose decisions have heretofore been in line with the best decisions of the other commissions, has, in the case of the Phillipsburg Light, Heat and Power Company, approved a competitive franchise without giving the existing company reasonable time to improve its service.

The California commission several years ago attempted to bridge over a very difficult situation which confronted it at the beginning of its administration, by advancing the theory of "development duplication". This decision already has embarrassed the California commissioners, and we believe that it will still further embarrass them, and that in the end it must be abandoned. The New Jersey Commission, however, has not the excuse of the California Commission, and in the Phillipsburg case has openly departed from the very sound doctrine which it laid down in its early cases. A careful reading of the clauses contained in the decision leads us to believe that this decision was handed down against the better judgment of the Commission and that some issue, political or otherwise, has influenced the Commission in making such a reactionary decision.

The general public, influenced as it is by irresponsible criticisms of public utilities, has a right to look to the utility commission of President Wilson's own state for the soundest economic doctrine. We believe that a careful study of the facts in the case as here presented, should be of great benefit, not only to the utilities, but also to the public.

THE ELECTRICAL ENGINEER AND THE DEPARTMENT STORE.

In the stress and strain of department-store activities the engineering phases of such work have been too much neglected, but better days are on hand for technically trained men in this important mercantile industry. The modern retail dry goods house of large size has many demands upon the engineer which require comprehensive treatment beyond the capabilities of the janitor force and which often deserve a broader study than can be given by men whose experience has been confined purely to power-plant operation. The electrical engineer has a real field of usefulness here, and as fast as store owners and managers realize this, the addition of such men to the staff will become an ordinary occurrence.

At present engineering work in established stores is very exacting, involving long hours and crowded duties, in which the direction of steam-plant operators, wiremen, inspectors and other employees must be conducted in the face of imperative demands for quick changes in the physical arrangements of the house, and with constant regard for the safety of life and property. Much of this work must be done at night and on Sundays and holidays, and the pressure which it puts upon an engineering executive can be properly carried only by a man of tact, energy and sound technical ability. But while the work is strenuous, it is filled with interesting problems; it is closely related to the ultimate success of the establishment from the money side; and is well provided with opportunities to take advantage of the latest progress in equipment applications in both mechanical and electrical lines.

The work of the electrical engineer in this field is extremely varied. Whether the store operates its own plant or purchases electricity, the economical use of light and power in the face of the continual departmental changes in displays characteristic of the business is a fertile subject for study; the opportunities for introducing efficiency methods are numerous, and the possibilities of designing new power-driven displays, of improving general and local illumination and of working out specially efficient and distinctive advertising by electrical methods are as yet but little realized in many quarters. Improved standards of electrical inspection are desirable in many stores, and the prevention of fire through the misuse of electrical equipment, through the installation of carelessly wired temporary apparatus or incomplete protection of heating devices, lamps and automatic switches is a matter well worth the attention of trained men. Such installations are continually shifting in their makeup and subdivided usefulness and something beyond easy-going tolerance is necessary to insure safe and effective results in the handling of equipment.

Within the last year or two the thoroughly equipped department store has been utilized to some extent as a field for thesis investigation by students in engineering courses, and the practical interest of such work is considerable, being closely concerned with electrical matters. The problems dealt with range from tests of coal-handling apparatus to comparisons of the cost of central-station and isolated-plant service and they frequently suggest lines of improvement which can be carried out at moderate expense. Researches of this character are well worth the study of operating electrical engineers and through their aid data of much value can be obtained in many cases where properly qualified and carefully supervised students are permitted to analyze conditions. The power requirements of fine stores are often large on account of the elevator, escalator, pumping and air-compressor service regularly maintained; the load characteristics are diversified, and seasonal changes in trade produce interesting variations in plant output. The larger the store, the more necessary its proper electrical superintendence becomes, and the complex work of such establishments, the large number of persons housed in them through business hours, and the value of the stock maintained for storage and sale justify a broader employment of electrical engineering ability than has formerly been the usual practice.

Electrical Exports for December and January and for the year 1913.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has completed monthly summaries of imports and exports of the United States for the months of December, 1913, and January, 1914. The following data respecting electrical exports for these two months and also the total for the year 1913 are derived from this source.

During December the total electrical shipments maintained the average of the year quite satisfactorily and were also somewhat greater in volume than those of the corresponding month of the preceding year. For the four classes for which numbers of articles are reported, there were shipped during December, as follows: electric fans, 1,513; arc lamps, 215; carbon incandescent lamps, 120,031; metal-filament lamps, 71,651.

In the following table are given the classified figures for last December and also for the corresponding month of the preceding year, as far as the detailed figures of the latter are available:

Articles	Dec., 1913	Dec., 1912
Batteries	$ 45,928	.....
Dynamos or generators	181,407	$ 261,167
Fans	19,012	11,602
Insulated wire and cable	190,090	.....
Interior wiring supplies	52,125	.....
Lamps—		
Arc	2,776	18,236
Carbon-filament	14,785	14,278
Metal-filament	21,267	29,329
Motors	376,122	363,113
Static transformers	134,213	.....
Telegraph instruments (including wireless apparatus)	31,999	9,693
Telephones	159,030	89,341
All other	1,005,245	1,392,055
Total	$2,233,999	$2,186,264

In the following table are given the monthly totals for the year 1912, this showing the fluctuation of the figures from month to month:

Months, 1913	Electrical Exports
January	$2,217,625
February	2,219,969
March	2,489,374
April	2,551,131
May	2,558,887
June	2,314,732
July	2,318,502
August	2,279,015
September	2,254,254
October	2,516,583
November	2,243,460
December	2,233,999

In the following table are given the yearly totals for the past five years. From this is shown the remarkable growth in electrical exports, which in the year 1913 broke all previous records:

Years	Electrical Exports
1908	$12,613,730
1909	13,027,550
1910	17,001,126
1911	19,355,536
1912	23,212,813
1913	28,197,363

As shown by the following tables the electrical export figures for January of this year show a slight falling off in the total compared with January, 1913. The number of electric fans exported was 2,829; arc lamps, 511; carbon-filament lamps, 70,021.

The following table gives the classified figures for this month and also for the corresponding month of a year ago:

Articles	Jan., 1914	Jan., 1913
Batteries	$ 43,892	.....
Dynamos or generators	199,046	$ 165,469
Fans	43,236	29,771
Insulated wire and cable	174,321	.....
Interior wiring supplies	46,452	.....
Lamps—		
Arc	9,204	5,850
Carbon-filament	13,910	29,185
Metal-filament	21,840	29,509
Motors	346,782	376,864
Static transformers	128,788	.....
Telegraph instruments (Including wireless apparatus)	12,788	9,458
Telephones	70,265	83,952
All other	837,122	1,487,567
Total	$1,947,646	$2,217,625

Meeting of Philadelphia Vehicle Section.

The monthly meeting of the Philadelphia Section, Electric Vehicle Association of America, was held on the evening of March 11 in the meeting room of the Philadelphia Electric Company. The paper of the evening was by D. B. Wilson, of the General Electric Company, and was entitled, "Charging Apparatus Used in Public and Private Garages."

Mr. Wilson went very thoroughly into this subject, explaining in detail the various kinds of rectifiers and charging boards, showing illustrations of them, and the practical application of the several types of rectifiers. He called particular attention to the improvement of the present rectifier over the old style, and stated that further improvement was expected to be made. He referred briefly to the new iron-tube rectifier, which is not yet ready for the market, but on which experiments are being made.

The paper was discussed by Messrs. Bartlett, E. R. Whitney, F. E. Whitney, Gross, Nealey, Wallis and others.

There were over 40 present at this meeting and the officers are very much encouraged over the success of the new section.

Utah Jovians Plan Rejuvenation.

John C. Jones, statesman for Utah of the Jovian Order, called a meeting on March 11 to arrange the details for a rejuvenation to be held on April 21 concurrently with a general meeting of the local representatives of the Utah Power & Light Company which is to be held in Salt Lake City on that date.

American Society for Testing Materials.

The executive committee of the American Society for Testing Materials has announced that the seventeenth annual meeting will be held at Atlantic City, N. J., June 30 to July 4, with headquarters at Hotel Traymore.

The Electric Club of Chicago.

At the meeting of The Electric Club of Chicago held on March 12, Arthur H. Young, supervisor of labor and safety of the Illinois Steel Company, Chicago, made a very interesting illustrated address entitled "The Wonderland of Steel." Mr. Young described the various chief steps in the production of several kinds of steel, starting from the mining of the ore in the Northern Michigan mines, its transport to the docks and shipment to the steel works, unloading, storing, and charging of the blast furnaces. He briefly explained how electric power is derived from the waste gases and then described the conversion of the iron from the blast furnace in a Bessemer converter, also in the open-hearth furnace and in the Heroult electric furnace. He explained the method of rolling rails and of rolling structural and plate steel.

Taking up the human side of the industry, Mr. Young spoke of various means that are used to promote the welfare, not only of the employees, but also of their families. He explained the pension system in use, the system of visiting nurses, clubs and other welfare work. Mr. Young concluded his address with a brief reference to some of the methods used to promote safety and carefulness among the employees and showed a number of appliances that have been used to reduce the hazards to a minimum. Throughout Mr. Young's address he showed a great many lantern slides of the various stages in steel making and of other views connected with the industry.

Electrical Association of Wilmington Holds Meeting

At the March meeting of the Electrical Association of Wilmington, N. C., held March 5, W. C. Andrews of the Edison Storage Battery Company, Orange, N. J., gave a talk on the construction and operation of the Edison alkaline-nickel-iron battery. The association is now in its second season with a membership of sixty drawn from the electrical interests about Wilmington—central station, railway, telegraph and telephone, contractors and dealers, and the electrical engineering department of the Atlantic Coast Line which has its main office in Wilmington. Monthly meetings are held at which practical subjects are discussed, that for the April meeting being current consuming appliances with a paper by R. H. Bouligny of the Western Electric Company's Richmond office. The club owes its present enviable success to the hard work of its president, Raymond Hunt, superintendent of the Tide Water Power Company and its vice-president, Charles R. Sugg. of the Atlantic Coast Line.

George Westinghouse Dead.

George Westinghouse, the famous inventor and engineer, died of heart disease at his New York City residence on Thursday, March 12. His health had been failing for some time and consequently his death, though a great shock to his thousands of friends and acquaintances all over the country, was nevertheless in a measure anticipated.

The mental alertness and wonderful vitality that had so characterized his brilliant career remained with him to the end.

Although actively associated with a large number of industries, he had, during the last few years, begun to transfer his responsibilities to the shoulders of his trusted lieutenants, the fortunate selection of which has always been one of the leading characteristics of his varied career.

His demise, therefore, will not cause any material change in the policy or operation of the companies so indelibly linked with the name Westinghouse.

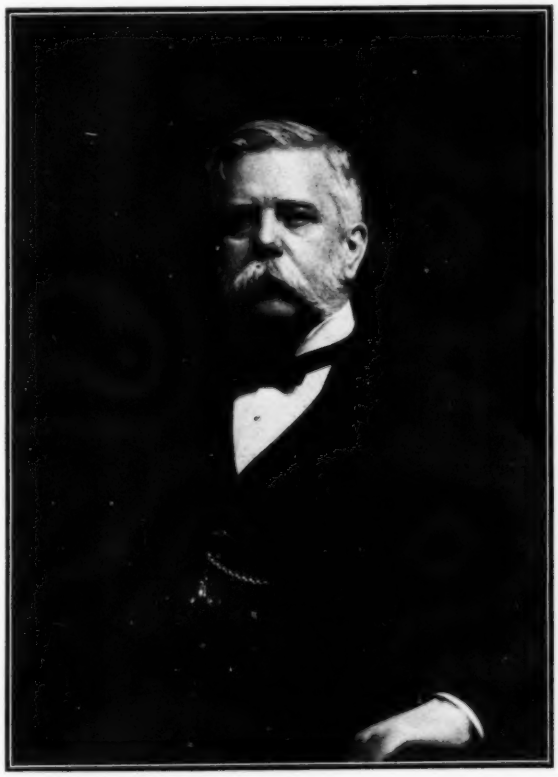
George Westinghouse was born at Central Bridge, Schoharie County, N. Y., on October 6, 1846; his parents were George and Emeline Vedder Westinghouse. The father's ancestors came from Germany and settled in Massachusetts and Vermont before the Revolution; the mother's were Dutch-English. Mr. Westinghouse's father was an inventor, who, in 1856, removed his family to Schenectady, N. Y., where he established the Schenectady Agricultural Works.

The boy attended the public and high schools of the town, spending much of his leisure time, after studies, in his father's machine shop. What to other lads would have been regarded as irksome and confining young Westinghouse found to be a source of amusement and instruction. Before he was fifteen he invented and made a rotary engine, and passed at an early age the examination for the position of assistant engineer in the United States Navy.

In June, 1863, though barely seventeen, he enlisted in the Twelfth New York National Guard. He was discharged at the end of November of the same year, and joined the Sixteenth New York Cavalry, being chosen corporal. He was honorably discharged in November of the following year, and a month later accepted an appointment as third assistant engineer, United States Navy, reporting for duty to the "Muscota," from which he was transferred to the "Stars and Stripes" and detached and ordered to the Potomac flotilla, June 28, 1865.

At the close of the war, resisting solicitations to remain in the Navy, and wishing to continue his college studies, Mr. Westinghouse tendered his resignation and was honorably discharged, August 1, 1865.

On his return he entered Union College, where he remained until the close of his sophomore year, and, obedient to his impulse toward experiment, abandoned his classical studies and entered upon active life, to find a wider scope for his inventive genius.



George Westingh use.

In 1865 he invented a device for replacing railroad cars upon the track, which, being of cast steel, was manufactured by the Bessemer Steel Works, at Troy, N. Y.

Going to Troy one day, a delay caused by a collision between two freight trains, suggested to Mr. Westinghouse the idea that a brake under the control of an engineer might have prevented the accident. His first thought was an automatic brake attached to the couplers which was unsuccessful. This was followed by steam, which proved also to be unsatisfactory because by the time it reached the brake from the engineer's cab it lost its power. Finally it occurred to him to investigate the use of compressed air. Drawings of the air-pump, brake cylinder and valves were made, but considerable time elapsed before a practical trial of the brake was obtained. The first patent was issued April 13, 1869, and the Westinghouse Air Brake Company was formed on July 20, following.

Many changes and improvements were being made in the brake all the while, the business flourished, and the manufacturing works, begun in 1869, were completed in 1870. In 1870 Mr. Westinghouse went abroad to introduce the air brake in England—a difficult problem, as the trains in Europe had hand brakes upon only what were known as "brake-vans," there being no brakes upon the other vehicles. Not only did this require the spending of seven years in Europe, between the years 1871 and 1882, but it taxed his inventive ability to meet the new conditions.

In the meantime, Mr. Westinghouse invented the "automatic" feature of the brake which overcame the imperfections in the first form, and removed the danger from the parting of trains on steep grades. In 1886 he invented the "quick-action" brake, the improvement being made in what is known as the "triple-valve." By this valve it became practicable to apply all brakes on the train of 50 freight cars in two seconds. The automatic and quick-action brakes are regarded by experts as surpassing the original brake in ingenuity and inventive genius, being not mere improvements, but distinct inventions.

About 1880 Mr. Westinghouse became interested in the operation of railway signals and switches by compressed air, and soon after there was developed and patented the system now manufactured by The Union Switch & Signal Company. The "Pneumatic Interlocking Switch and Signal Apparatus," whereby all the signals and switches are operated from a given point, using compressed air as the motive power, and electricity to bring that power into operation, has been successfully introduced in Boston, Jersey City, Philadelphia, Chicago, St. Louis, and many other places.

In 1886 the Westinghouse Electric

Company was formed for the manufacture of lamps and electric lighting apparatus, Mr. Westinghouse having become interested in the subject. The business rapidly developed and in 1889 and 1890 this company absorbed the United States Electric Company and the Consolidated Electric Light Company. In 1891 all these properties were reorganized into the Westinghouse Electric & Manufacturing Company, which owns extensive works at East Pittsburgh, employing over 22,000 people.

In 1892 Mr. Westinghouse secured for the Electric Company the contract for the electrical equipment of the World's Fair at Chicago, and in 1893 the contract for the large generators at Niagara Falls, both of which marked epochs in the progress of the electrical industry.

In 1895 the Electric Company outgrew the small quarters at Garrison Alley and moved to East Pittsburgh and the same year works of the British Westinghouse Company were established at Manchester, England.

The question of the steam turbine and its applications was investigated by Mr. Westinghouse and he secured the patent rights of Charles A. Parsons, of England, on the turbine in 1897-98. This development of a new prime mover soon led the inventor to consider the use of the turbine as a prime mover for ships. The trouble was the high speed. Mr. Westinghouse then developed and brought out one of the most ingenious devices of modern engineering. This was the mechanical reduction gear for reducing the inherently high speed of a turbine to the slow speed of a ship propeller or direct-current dynamo. He accomplished this work in collaboration with the late Admiral George W. Melville, U. S. N., and John H. MacAlpine. Within the last few years he also occupied himself with the development of an air-spring for automobiles and motor trucks which rapidly came into favor.

Mr. Westinghouse rendered an invaluable service to the electrical development of the world, when, in spite of opposition, ridicule and efforts to crush his alternating-current system, he remained steadfast in his belief that this class of high-tension transmission would make distant electrical distribution possible. The world today recognizes its debt to his genius and courage.

A struggle almost identical with that of the earlier fight for alternating-current transmission, is the recent development of alternating-current traction by means of the single-phase motor which the Westinghouse Electric and Manufacturing Company has now wrought into an accomplished reality in the case of a number of traction lines, railroad terminals and tunnels.

The value of natural gas to the manufacturing industries of Pittsburgh was foreseen by Mr. Westinghouse, who organized a company to develop this vast resource of Western Pennsylvania, and who met in characteristic fashion the engineering problems involved.

Originating with one of the most important inventions connected with railways, the growth of the various Westinghouse industries has been largely identified with railway progress, and it is interesting to note that this progress has represented increased security of life, increased capacity of the railway and reduced cost of operation. It is simply stating a simple fact to say that Mr. Westinghouse has been a great factor in the advance of civilization as represented by the important part he has played by introducing improved means of transportation.

Chance has had no place in the success of this man. It has been due to his foresight, courage and technical skill. As with his first invention, the air brake, the different kinds of apparatus has been developed to answer actual needs, in some cases acknowledged generally, and in others foreseen by him with remarkable prevision. When the apparatus had passed the experimental state and was ready for commercial exploitation, he established factories which are themselves models, and which show the same anticipation of future development. Not only are the buildings handsome and well equipped with the best tools, but the comfort of the employees has been considered in every respect. It is worth noting that the nine-hour day, or rather the fifty-four-hour week, was started in the Air-Brake Works in 1869, and has been adopted in all the other works.

Owing to his many achievements in mechanics, electricity, steam and gas, his name was known the world over, and he had many honorable distinctions conferred upon him for his achievements and in recognition of the services he rendered the various branches of engineering. His alma mater, Union College, of Schenectady, conferred upon him the degree of doctor of philosophy. He was decorated with the order of the Legion of Honor, with the order of the Royal Crown of Italy, with the order of Leopold of Belgium. He was the second recipient of the John Fritz medal. He received the degree of doctor of engineering from the Koenigliche Technische Hochschule of Berlin, Germany. He was an honorary member of the American Society of Mechanical Engineers, of which body he was also president in 1910. He was one of the two honorary members of the American Association for the Advancement of Science. He was an honorary member of the National Electric Light Association of America. He was awarded the Scott premium and medal by the Franklin Institute of the State of Pennsylvania. He received the Edison gold medal for meritorious achievements in the alternating-current system of electrical distribution. He received the Grashof gold medal from the Society of German Engineers in Germany, which acknowledged him the greatest American engineer.

Mr. Westinghouse was president of the Westinghouse Electric & Manufacturing Company for nearly a quarter of a century. Following financial difficulties in 1907 the company, after a 14-months' receivership, was reorganized and in July, 1910, Mr. Westinghouse was succeeded by Robert Mather as president of the company. At that time he held the offices of president and director in sixteen companies, including the Canadian Westinghouse Company, Limited, the Cooper Hewitt Electric Company, East Pittsburgh Improvement Company, Nernst Lamp Company, Pittsburgh Motor Company, Security Investment Company, Societa Italiana Westinghouse, Paris Société Anonyme Westinghouse, St. Petersburg Société Electrique Westinghouse de Russie, Paris; Union Switch & Signal Company, Westinghouse Air Brake Company, Westinghouse Brake Company, Limited, of London; Westinghouse Cooper Hewitt Company, Limited, of London; Westinghouse Electric & Manufacturing Company, Westinghouse Lamp Company, Westinghouse Machine Company. He was also chairman of the board of directors of the British Westinghouse Electric & Manufacturing Company, Limited, of London; the Société Anonyme Westinghouse, Paris; Westinghouse Electric Company, Limited, of London, and director of the Consolidated Car Heating Company, the Electric Power Securities Company of Niagara Falls, Electric Properties Company, Traction & Power Securities Company, Limited, of London; Westinghouse, Church, Kerr & Company, Westinghouse Foundry Company, Westinghouse Metal Filament Lamp Company, and the Westinghouse Metallfaden Gluhlampenfabrik, G. m. b. H., of Vienna. After his retirement from the presidency of the Westinghouse Electric & Manufacturing Company, Mr. Westinghouse resigned from his offices in several of

the other companies allied with this concern.

The Westinghouse Companies employ 50,000 men on whom 150,000 persons are dependent. The total capitalization of all the companies is $200,000,000.

Mr. Westinghouse was married August 8, 1867, at Brooklyn, N. Y., to Marguerite Franklin Walker. They had one son, George, who is a graduate of Yale, and was recently married to the Honorable Evelyn Violet Brocklebank. His wife and son survive him.

Prominent Men Attend Westinghouse Funeral.

More than 1,500 persons, including every grade of industrial and scientific attainment, men whose names stand high in the commercial and scientific world, attended the funeral services for George Westinghouse, which were held in the Fifth Avenue Presbyterian Church, New York, on Saturday afternoon. There was a brief service at Woodlawn Cemetery where the family and friends attended the interment.

The honorary pallbearers who preceded the coffin into the church at half past two o'clock, were Charles Francis Adams, Horace F. Andrews, Charles J. Canda, Charles Crane, George Gibbs, T. A. Gillespie, J. M. Guffey, J. H. Gantt, W. S. Hawk, E. M. Herr, W. T. Kerr, A. L. Humphrey, Alexander C. Humphreys, T. B. Kerr, Walter M. McFarland and J. R. McGinley.

The chief mourners were Mrs. George Westinghouse, the widow, H. H. Westinghouse, a brother, and Mrs. Westinghouse, and Mr. and Mrs. George Westinghouse, Jr.

The Rev. Dr. J. H. Jowett, pastor of the Fifth Avenue Presbyterian Church, opened the services with prayer and an address was delivered by the Rev. Dr. Samuel J. Fisher, of Pittsburgh. Dr. Fisher and Mr. Westinghouse were lifelong friends, and the former paid a glowing tribute to the work and character of Mr. Westinghouse.

The coffin was banked high with floral offerings from every part of the country, including an orchid wreath from the President and Mrs. Woodrow Wilson, and a piece composed of orchids and violets from William G. McAdoo, secretary of the treasury, who had been a long-time friend of Mr. Westinghouse.

The active pallbearers were eight veteran employees who had served with Mr. Westinghouse since he opened the mechanical and electrical shops in the Turtle Creek Valley, near Pittsburgh. They were headed by Christopher Horrocks, the oldest employee of all.

Telegrams and cablegrams of sympathy and respect were received by Mrs. Westinghouse from all parts of the world. Many delegations of national engineering and scientific organizations attended the funeral services, the delegation from the American Society of Mechanical Engineers attending in a body and consisting of James Hartness, president; Dr. A. C. Humphreys, Jesse M. Smith, Ambrose Swasey, Worcester R. Warner, Henry R. Towne, Col. F. D. Meier, Dr. W. F. M. Goss, Prof. R. R. Hutton, E. B. Katte, I. E. Moultrop, H. G. Stott, H. L. Gantt, E. E. Keller, H. G. Reist, Charles J. Davidson, Henry Hess, George A. Orrok, W. B. Jackson, H. M. Leland, Alfred Noble, A. M. Greene, Jr., John Hunter, Elliott H. Whitlock, Robert M. Doxon, William H. Wiley, and Calvin W. Rice.

The National Electric Light Association was represented by a delegation officially appointed by President McCall, comprised of Past-Presidents H. L. Doherty, Frank W. Frueauff, Dudley Farrand, and Arthur Williams, Secretary T. C. Martin and Assistant Secretary S. A. Sewall. The New York Electrical Society was represented by Past-President M. I. Pupin and Secretary G. H. Guy. Others who attended were Charles A. Terry, Nikola Tesla, H. H. Vreeland, Paul D. Cravath, Arthur Warren, George B. Oliver, Samuel Rea, L. B. Stilwell, Guy E. Tripp, W. D. Updegraff, Daniel Willard and F. D. Underwood.

Memorials to Mr. Westinghouse.

Two thousand and more persons assembled in the Welfare Building at Wilmerding, Pa., on the afternoon of March 14, to attend the memorial exercises of Mr. Westinghouse. John McNaughten, president of the United Presbyterian Theological Seminary, delivered the principal address. The building in which the exercises were held was presented to the Y. M. C. A. of Wilmerding, which town he founded, by Mr. Westinghouse.

The directors of the Westinghouse Electric & Manufacturing Company adopted the following resolutions on the death of Mr. Westinghouse:

"The history of this organization from the time of its creation by Mr. Westinghouse to its present magnitude is the story of the genius, wisdom, courage and foresight which placed him among the foremost men of his age.

"By his death a high minded and inspiring leader of men has been taken away. There has been a great public loss.

"It is with sorrow that the board registers this last sad memorial among the chronicles of the company built by him and orders it engrossed and forwarded to his family."

Commission Control Proposed for Massachusetts Hydroelectric Companies.

The subject of the regulation and control of hydroelectric companies in Massachusetts by the State Gas and Electric Light Commissioners was argued at a hearing before the Public Lighting Committee of the Massachusetts Legislature March 11. A bill, introduced by Senator Francis J. Horgan, provides that these companies shall be subject to the same jurisdiction by the Commission as are the lighting companies. Senator Horgan asserted that the water powers of the State are virtually controlled by a single interest. He held that the companies should pay the State for the use of the powers.

Other proponents of the measure advocated full publicity of the affairs of the companies, together with supervision by the Commission. They held that not only the consuming public but also the investors would benefit by reason of the well maintained values of the securities which would result from State supervision, citing the stability and high repute of lighting companies' securities in the State.

H. I. Harriman, of Chase & Harriman, engineers for the Connecticut River Power & Transmission Companies, said the companies he represents "are not opposed to reasonable and proper regulation."

The bill as drawn provides a penalty of $1,000 for each failure to comply with the rules, regulations and authority of the Gas and Electric Light Commission.

Mine Telephone and Signal Circuits.

The British regulations relating to uses of electricity in mines contain a rule reading: "Where electricity is used for signaling the pressure in any one circuit shall not exceed 25 volts." This has been interpreted by some mining authorities to relate also to water-tight telephones and to require that the voltage of magneto generators should not exceed that figure. The Telephone Manufacturers' Association, therefore, found it necessary to approach the Home Office Department, pointing out that it was commercially impossible to provide telephones with a generator which will ring bells satisfactory with a potential of only 25 volts. The authorities have now cleared the matter up by stating definitely that the rule relates only to signaling and not to telephones.

It is estimated that water powers in France possible of development aggregate about 4,500,000 horsepower, of which only 800,000 is now utilized.

Public Utilities Discussed by Western Society of Engineers.

At a meeting of the Western Society of Engineers held on the evening of March 16, at which Vice-president B. E. Grant presided, the subject for general discussion was a symposium on public utilities. This was intended partly as a continuation of the discussion at the annual meeting of the Society, at which Dean M. E. Cooley of the University of Michigan had presented a paper entitled "Factors Determining a Reasonable Charge for Public Service;" an abstract of this paper was presented in our issue of January 17, 1914.

At Monday's meeting the subject was introduced by a paper entitled "Government Regulation of Railroads from the Investor's Standpoint," by Andrew Cooke. He opened his paper by an expression of regret that the Interstate Commerce Commission had not yet passed on the case of the Eastern railroads who are seeking a five-per-cent raise of freight rates; an early decision on this matter would be desirable to put railroad securities on a better footing. The government ownership of railroads has been urged, because the government can secure money at a very low rate of interest. However, if railroads were enabled to finance improvements at similar low interest rates this argument for government ownership falls to pieces. Mr. Cooke showed how this can readily be done. Railroad investments can be made more secure by better and fairer tax laws, by regulated competition and by reasonable regulation of rates based on fair valuation. He recommended that rates be determined on such a basis which should be liberal to the corporations; any surplus earnings derived in especially good years should be used for betterments of the system without charging same to the capital account.

Samuel O. Dunn, editor of the *Railway Age Gazette,* then presented a paper dealing with appraisals of railroad property. The fundamental principles of government regulation are appropriately based on the fifth and fourteenth amendments of the United States Constitution regarding condemnation of private property. In all rate regulation the fair present value of the property should be the same as that which is used in condemnation proceedings. Mr. Dunn discussed the valuation of land in particular and combated the statement frequently made that the unearned increment be not credited to the railroads; such a policy would be gross injustice to these utilities. He agreed with Mr. Cooke in advocating the use of surplus earnings for betterments in the property, but these earnings, while not put into the capital account, should be allowed for in the valuation. Such a valuation of a railroad system must give the depreciated value of the physical property. A reasonable going value must be allowed for. In making assessments for taxation intangible values are usually taken into account, therefore why should it be more difficult to allow for them in valuations for rate making?

The third paper of the series was presented by Harold Almert; it was entitled "Rate Regulation from the Standpoint of the Public and of the Engineer." Nearly 40 states have now passed laws regulating utilities and similar laws are pending in other states. This shows that utility regulation is a very live topic. The great majority of the public means to be fair, although there is always an element that is unscrupulous in its demands. The public wants merely to have good service at reasonable rates. As a rule the public is not well informed as regards investments of utilities. The only information available is that of investment brokers or bankers and unfortunately in too many cases this does not disclose all of the truth. There are nearly always present in a community so-called reformers and actual demagogues who are ready to stir up trouble. The newspapers are really under obligation to clear up the situation in regard to utilities.

Mr. Almert stated that many utility laws were evidently poorly considered and drafted. Many utility commissions also are not well constituted, because their members are not versed in the subject. The importance of keeping politics from commission regulation cannot be emphasized too greatly. If a commission has a good engineering and accounting staff and is broad minded, even though the members themselves may not have had special training in utility work, the prospects for satisfactory regulation are fairly bright. In several states such commissions, well organized and with good assistants, are to be found and their rulings are rightly looked upon as precedents because they actually constitute ideal commission regulation. The broad subject of utility regulation is a very complicated problem. Its solution lies not with the lawyer alone but probably best with a broad-minded engineer who has had some study of law and of economics. Such an engineer can be relied upon to present all sides of the question fairly. He must study the problem in detail and state his conclusions frankly, regardless of whether they are in favor of the utility or of the public.

The general discussion of the subject was opened by John W. Alvord, who stated that regulation and valuation of utilities was started about 16 years ago when the franchises of a number of water-works companies began to expire. The subject has become more important from year to year and at the present time about one billion dollars of utility property is appraised yearly for regulation purposes. Although the subject of regulation is an intricate one with many sides to it, one of the chief difficulties arises because the public has not decided what it wants to appraise. One party believes that only the actual money spent in the utility must be allowed for in the valuation; another party believes that the utility property must be accorded the same rights as other private property and on this there must be allowed a fair return. Although most appraisal work is of an engineering character, it must in all cases be based on a clear definition of the law. All valuations must be the co-operative work of the lawyer, engineer and economist or business man. Mr. Alvord discussed briefly the confusion existing with regard to going value of a utility concern and he gave an excellent example, which he had recently cited before a commission, showing the difference between a carefully appraised dead horse and a live horse. On the whole, however, despite their lack of technical knowledge in many cases, the state utility commissions are doing quite satisfactory work.

W. B. Jackson said that the problem of regulating utilities is still in its early stages and a comprehensive solution has by no means been reached. He stated that utilities should be looked upon in the same way and be given the same consideration as other industries, such as manufacturing for instance. In general, it is less important to have low rates than it is to have good service at reasonable rates; the latter would permit the use of excess earnings for improvement of the property. However, Mr. Jackson was not in favor of using excess earnings without capitalization.

James E. Quan, chairman of the Illinois Public Utilities Commission, made a brief address, and W. A. Shaw, also a member of this commission, said that he was pleased to find the Western Society of Engineers taking up live topics of the day. On behalf of the Illinois Commission he said that it was attempting to meet the issues presented before it fairly as they arise. In the matter of regulation of utility rates the Commission would quite certainly allow a fair return on the investment. Lyman E. Cooley spoke of utilities as public bodies. He was in favor of having utilities issue but one kind of security with amortization features, as is done so successfully in France. A. C. King, deputy city electrician of Chicago, spoke briefly of the use by utilities of streets, alleys and other public property, for which the public is entitled to receive some return, which should be taken into account in rate determinations. Prof. Morgan Brooks, of the University of Illinois, spoke of the importance of maintaining quality of service. If service is of high quality, the question of rates is of less importance and probably would never have been raised.

Electricity in Breweries.

By F. M. Welles.

This complete description of a Baltimore brewery which has recently discarded its obsolete isolated-plant equipment and installed central-station service, indicates clearly that electric drive is essential to the production of a high quality of product. Incidentally, many operating economies have been effected since the change was made.

As an example of one of the very few breweries in the eastern part of the United States which employs exclusively central-station power throughout, the accompanying views of the Gottlieb, Bauernschmidt, Strauss Brewery, at Conway and Hanover Streets, Baltimore, Md., are both timely and interesting.

Early in 1912 when this company was perfecting the formula for its proposed new beer (later named the "Arrow"), due cognizance was given to the necessity for, first, superior quality of ingredients and, second, superior quality of equipment. Accordingly, it was decided to use only the purest and most wholesome barley malt and imported German hops, flaked corn, etc., to install the most up-to-date manufacturing and storing apparatus, and to employ central-station power for all available purposes.

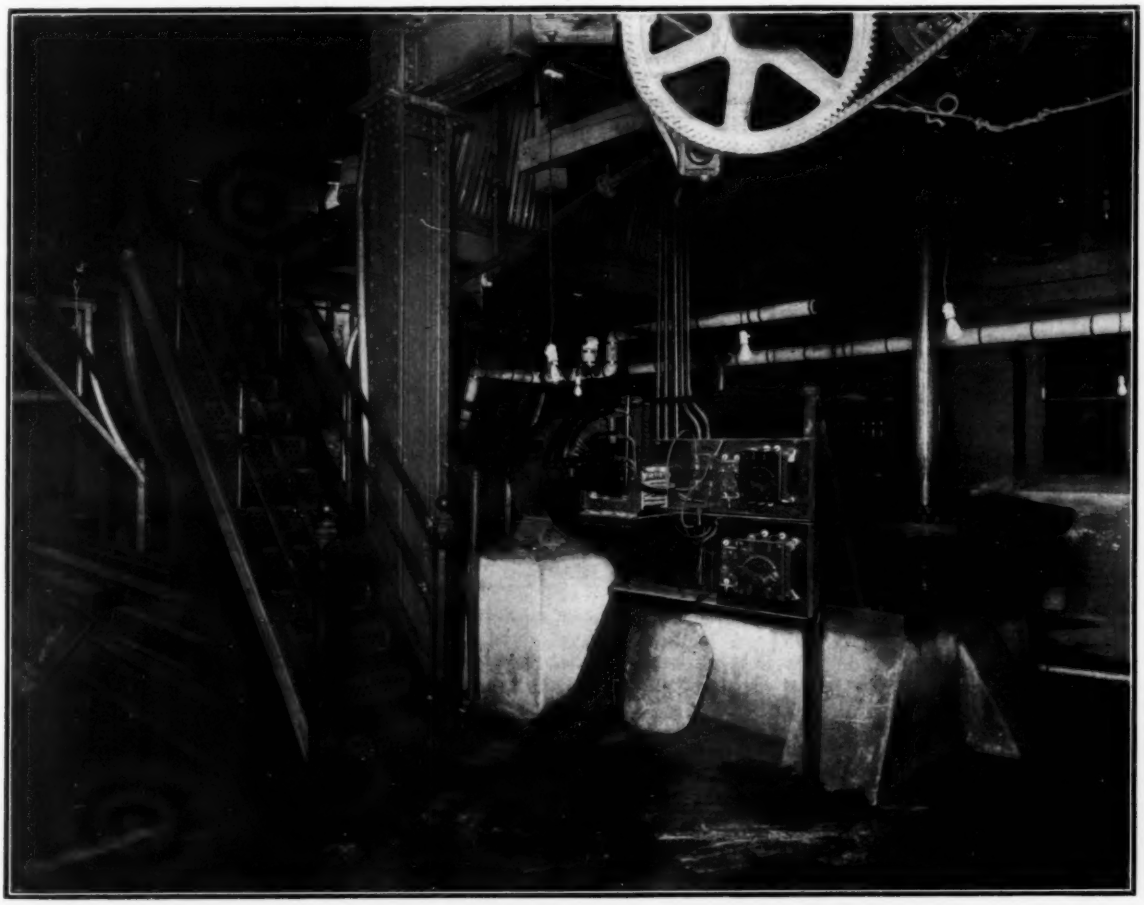


Fig. 1.—Mash Tub Driven by 20-Horsepower Motor Coupled to Original Gearing.

About July, 1912, further plans for a reorganization of the company's various local plants began development towards a centralization in the Hanover Street plant. This scheme included the abandonment of the Darley Park Brewery on Harford Avenue, of the Central Avenue and Fawn Street bottling plant, also the bottling plant of the Eigenbrot Brewery. With the initial operation of the new bottling plant at Hanover Street in July, 1912, 120/240-volt Edison service was introduced from the underground system of the Consolidated Gas, Electric Light & Power Company to operate this machinery and from this time until the summer of 1913 the process of evolution from steam to electric drive has steadily proceeded, until at the present writing every available application of electricity has been made and the original 450-horsepower boiler plant supplies steam only for heating and brewing. The "Globe" Brewery, as it is more familiarly known, has a present capacity of 365 barrels per day brewed, or 100,000 barrels per year.

The changes which have taken place here can best be realized by a parallel study of the beer-making process with the drives employed in their proper sequence.

First, regarding the chemical composition of beer, we find it to be a beverage obtained by a process of al-

coholic fermentation, mainly from cereals (chiefly malted barley) hops and water with various substitutes for the two former, and certain preservatives. In order to explain the constituents of the finished product and their derivation, it is necessary to make sure that certain materials and terms are thoroughly understood.

The malt itself is the barley grain in which germination has proceeded to a certain point, where it is then arrested by removal of water and the application of heat, resulting in a softened raw grain. During this process, which forms a separate industry in itself, there are developed in the grain certain enzymes, which are a non-living organism found in the constitution of plants and animals and whose function is to decompose certain carbon compounds occurring in association with them. The germinated barley contains starch and diastase, the latter being a soluble nitrogenous ferment

Fig. 2.—Motor-Driven Malt Mill.

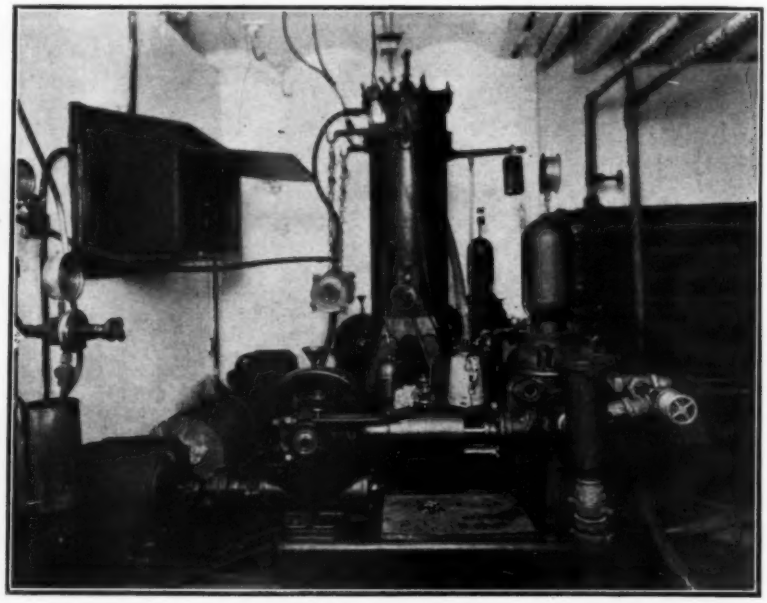


Fig. 3.—Motor-Driven Pumps for Racking the Beer; Carbonating Machine in Center.

formed in germinating grain and having the property of converting starch and dextrine into sugar.

Underlying the process of all beer making there are two essential chemical processes: (1) The conversion of starch by means of diastase into certain soluble substances, one of which is a fermentable sugar; (2) the decomposition of this sugar by means of the yeast organism into alcohol and carbon-dioxide gas (CO_2).

Having the above in mind we can now better appreciate the reason for the use of the substitutes previously mentioned. The diastatic enzyme or ferment of malted barley is present in that material in great excess, and a part of this surplus energy may be usefully employed in converting the starch of unmalted grain into sugar. Brewing operations are also simplified and accelerated by the use of a certain proportion of substitutes and thereby the turn-over with a given equipment can be very materially increased. Also certain substitutes, such as sugar, unmalted corn, rice, cereline, maize, etc., are cheaper than malt, although brewers seldom use more than 15 to 20 per cent of substitutes, as a larger percentage would seriously impair the quality of the beer.

In its earliest forms the beers were strongly alcoholic, but with the advent of tea, coffee, cocoa, etc., much lighter beverages became the vogue. The general run of beers now contains 3 per cent to 6 per cent of alcohol and 4 per cent to 7 per cent solids, the remainder being water and certain flavoring and preservative matters derived from the malt, hops and other materials employed in their manufacture. The solid, i.e., the non-volatile matter contained in solution in beer consists mainly of maltose, or malt sugar, of several varieties of dextrin, of substances which stand in an intermediate position between the sugars and the dextrins proper, and of a number of bodies containing nitrogen, such as the non-coagulable proteids, peptones, etc. In addition there is a considerable quantity of mineral matter, chiefly phosphates and potash. Dietetically regarded, therefore, beer possesses considerable food value and moreover the nutritious matter in beer is present in a readily assimilated form.

In short, the general scheme of mechanical operations in any brewery consists of seven distinct processes, as follows:

(1) Grinding: The malt, after cleaning and grading is conveyed to the malt mill, where it is crushed.

(2) Mashing: The ground malt or grist, as it is then called, passes to the "grist hopper" and from the latter to the mashing machine, in which it is intimately mixed with hot water from the hot-liquor vessel (water is called liquor in a brewery). From the mashing machine the mixed grist and liquor pass to the mash tubs, where the starch and the malt is rendered soluble.

(3) Boiling: From the mash tub the clear malt passes to the kettle, where it is boiled with hops. From the kettle the boiled malt passes to the hop jack where the insoluble hop constituents are separated from the malt.

(4) Cooling: From the hop jack the malt passes to the cooler, from the latter to the refrigerator, thence to the fermenting room.

(5) Fermenting: The liquid passes finally to the fermenting vessels, in which the malt is transformed into "green" beer.

(6) Cleansing: The beer is next separated from the products of fermentation and filtered.

(7) Racking and Storing: After filtering the beer is carbonated and either racked off to kegs or stored in the cellars for bottling.

The process in the Globe Brewery, which is, however, much the same in any other, begins with the storing of the malt. Brought to the malt house in bags of 90 pounds each, it is emptied into the boot of a 10-horsepower motor-driven bucket elevator which delivers to the large storage bins. From

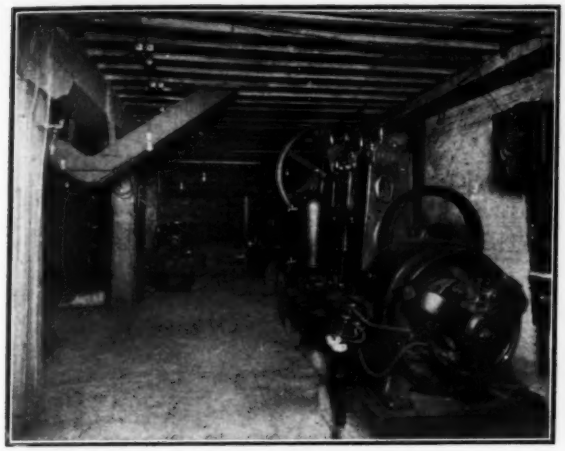


Fig. 4.—Pump Room.

Fig. 5.—Soakers and Rinsing Machines.

these bins a worm conveyor takes the malt across to the brew house where it passes first through the cleaning process. Two suction fans of 24-inch diameter each extract the dust and the material passes through a rotary screen to an automatic measuring machine. Hoisting by bucket elevator next delivers to the malt mill, from whence a second bucket elevator and a worm conveyor deliver the ground malt or grist to the mash tub. The exhaust fan, the two screens, the two worm conveyors and two bucket elevators mentioned above are driven by a belt-connected 20-horsepower motor.

The malt mill shown in Fig. 2, with 15-horsepower motor consists of two corrugated rolls, 12 inches in diameter and 30 inches in length, each revolving toward the other and the normal capacity is 300 bushels an hour. The malt must be watched carefully in the grinding. If it is ground too fine difficulties arise in regard to efficient drainage in the mash tub and subsequent clarification. On the other hand, if the crushing is too coarse the subsequent extraction of soluble matter in the mash tub is incomplete and the quality of the beer lowered.

The grist having been carried over to the mash tub, the mashing process now takes place. This consists mainly in extracting, by means of water at an adequate temperature, the soluble matter pre-existent in the malt and in converting the insoluble starch and a great part of the insoluble nitrogenous compounds into soluble and partly fermentable products. Mashing is, without doubt, the most important of the brewing processes, for it is largely in the mash tub that the character of the beer to be brewed is determined. The malt and the mashing "liquor" are introduced into the mash tub simultaneously by means of a mashing machine. This is a cylindrical metal vessel, commanding the mash tub and provided with a central shaft and screw. The grist enters the mashing machine from the grist case above and the liquor is introduced at the back. The screw is rotated rapidly and so a thorough mixture of the grist and liquor takes place, before the material enters the mash tub. Another method of accomplishing similar results, and which is used here, introduces cold liquor at the beginning and hotter liquor after the mashing process has gone on for some time.

Fig. 1 shows the present drive on the mash tub, the tub itself being just above and having its raker arms operated through double reduction gearing by the vertical shaft shown. The mash tub is a large metal vessel, of 250-barrels capacity, fitted with a false bottom of perforated plates to permit a proper separation of the "wort" (as the liquid portion of the finished mash is called) from the spent grains. The mash tub is also provided with a stirring apparatus to intimately mix the grist and liquor, and an automatic sprinkler or sparger is employed to wash out the wort remaining in the grains.

After being boiled for half an hour, the mash is mixed in the mash tub with corn flakes that have been brought from a nearby room by a two-horsepower motor-driven screw conveyor. The rakes are set going until the mass becomes thoroughly homogenous and

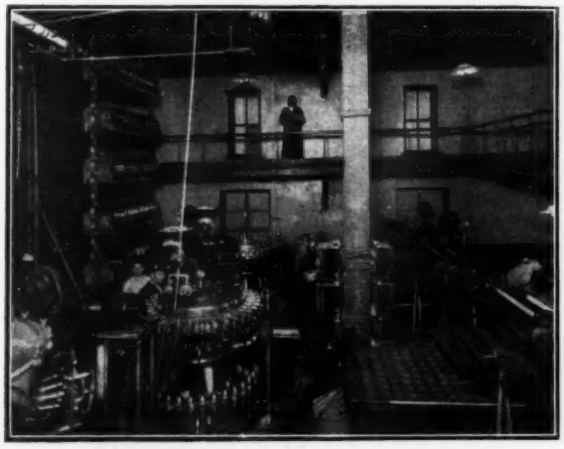


Fig. 6.—Rinsers, Fillers, Cappers and Sterilizers.

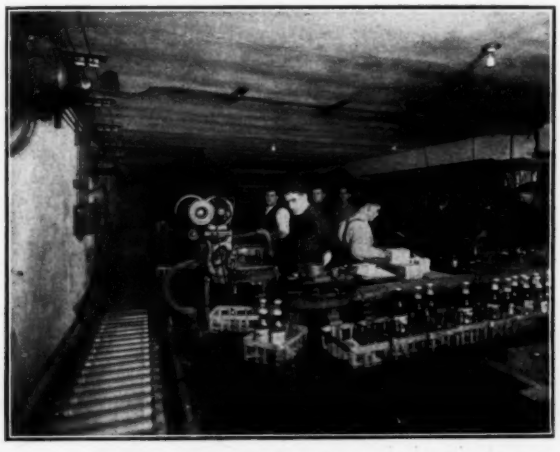


Fig. 7.—Carryalls, Labelers and Conveyor to Loading Platform.

the mash is then allowed to rest, usually for a period of about two hours. Communication is then established between the mash tub and the kettle, and the sprinkler, or sparger is started. In this manner the whole of the wort is extracted from the grains. The quantity of water employed, in all, amounts to about 130 barrels to every 100 barrels of beer. This is necessary to cover the loss of water (1) to the spent grains in the mash tub; (2) by evaporation in the copper; (3) through retention by the hops in the hop jack.

From the mash tub the spent malt grains are removed to the outside of the building by two screw conveyors, 19 feet and 34 feet long respectively, and driven by chains from a two-horsepower and a 3.5-horsepower motor. These spent grains contain a little starch, the insoluble portions of the malt, a little oil from the malt and a good deal of digestible fiber. They, therefore, possess high value as cattle feed and have about the same feeding and manurial value as wheat.

The wort from the mash tub passes to the kettle, which is a large copper vessel with a dome-shaped head, and heated by steam. When the wort has been raised to the boil, the hops are added and the boiling is continued.

The objects of boiling are: (1) sterilization of the wort; (2) extraction from the hops of substances that give flavor and aroma to the beer, (3) the coagulation of the nitrogenous matter which if left in would cause cloudiness and fret in the finished beer; and (4) the concentration of the wort.

Three distinct substances are extracted from the hops in boiling: (1) hop tannin, which combining with a part of the proteids derived from the wort, precipitates them; (2) hop resin, which acts as a preservative and bitter; and (3) hop oil, to which much of the fine aroma of the beer is due.

The quantity of hops employed varies from one to five pounds per barrel of beer, depending on the kind of beer.

When the wort has boiled the necessary time, it is turned into the hop jack to settle. The hop jack is a metal vessel with a false bottom; the latter retains the spent hops, the wort being drawn after a brief rest into the cooler. The cooler is a rather shallow vessel of great area and the result is that a part of the hop constitutents and other substances in the wort are rendered insoluble, besides allowing the wort to absorb oxygen in this areation process.

Located directly under the hop jack, a triplex 15-horsepower motor-driven pump, of 140 gallons per minute capacity is now used to pump the wort from the hop jack to the cooler. From the cooler the wort flows to the refrigerator, which brings it to about 41 degrees, Fahrenheit, the proper temperature for the fermentation stages.

The refrigerator allows a thin stream of wort to trickle over a series of pipes through the first portion of which cold water, and through the latter portion ammonia gas is circulated. The circulating water is furnished by a 85-gallons-per-minute triplex pump with a 10-horsepower motor, while the ammonia compressors which will be mentioned later, supply the ammonia for cooling.

From the refrigerator, the wort flows by gravity to the fermenting rooms, where it is converted into beer. By the addition of living yeast cells the sugar contained in the wort is split up into alcohol and carbonic-acid gas and a number of subsidiary reactions occur. The two main systems, designated by the position of the yeast in the cask are: (1) top fermentation; (2) bottom fermentation. The bottom fermentation obtains here and the low temperature method.

The wort, generally at 40 degrees is "pitched" with liquid yeast at the rate of one to four pounds to the barrel. After a few hours a slight froth or scum appears on the surface of the liquid gradually becoming lighter and more solid.

This hardens to a compact mass which emits great bubbles of gas with a hissing sound. At this point the "cleansing" of the beer (the separation of the yeast from the liquid) commences and the beer is let down into other casks for complete separation.

During fermentation the temperature rises considerably and in order to prevent an excessive temperature (50 degrees should be the maximum), the fermenting vessels are fitted with "attemperators," i. e., a system of pipes through which brine is circulated at 34 degrees, Fahrenheit, by a 120-gallon-per-minute triplex pump geared to 10-horsepower variable-speed motor.

The carbonic-acid gas generated during fermentation is collected by a Witteman gas compressor geared to a 7.5-horsepower motor whose operation is governed by the pressure of the gas, and which delivers to storage tanks from whence it is drawn again for the carbonating process.

After the fermentation and cleansing operation, the beer is racked off from the settling tanks into storage vessels or trade casks. Two of the four Witteman, 80 to 90 barrels per hour capacity, beer-racking pumps with a three-horsepower motor, also one of the carbonators, are shown in Fig. 3. An additional two-horsepower motor-driven portable pump is used in the cellars.

The transferring of the beer from the tanks to the pumps is done by carbonic-acid gas and compressed air which is also used in the bottling department to force the beer from the storage casks in the Government cellar up to the filling machines, and for holding pressure on the storage tanks to prevent the beer from foaming. The air compressor equipment at the Globe Brewery consists of an automatically operated 60-cubic-feet-per-minute compressor geared to a 11-horsepower motor, and a 15-horsepower motor-driven compressor (100 cubic feet per minute belt-connected), which operates constantly with an unloading device which only brings the cylinder into positive action between the fixed minimum and maximum pressures. These outfits may be seen in part in Fig. 4.

Both the bottled and the racked beer are carbonated. The beer when ripe for racking is first "chilled," or cooled to a very low temperature. As a result there is an immediate deposition of much matter which would otherwise require prolonged time to settle. The beer is then filtered and so rendered quite bright and finally in order to produce immediate "condition" is "carbonated," i. e., impregnated under pressure with carbon dioxide (carbonic-acid gas), the source of which has already been mentioned.

The filter is located in the same cellar with the racking pumps and carbonator. The filter-mass washer with five-horsepower motor is located in an adjoining cellar.

In the racking department there are a five-horsepower motor on keg elevator, and five-horsepower motor on keg-washing machine. In the bottling department there is now installed an aggregate of 41 motors, or 54 horsepower, some idea of the use of which may be gained from the following, which considers the work in its proper sequence.

Fig. 5 shows an end view of the two-bottle soakers with a two-horsepower motor each. The function of these machines is to facilitate the removal of old labels and accumulated dirt, the bottles being inserted into the soaker from the basement and delivered to the workers after about 40 minutes travelling through caustic soda and water at 212 degrees. The capacity of these machines is 78,000 bottles, or 250 barrels per day each. The bottles are passed from the soakers to the rinsers directly in the rear. These four rinsers with 0.75-horsepower motor each appear in the right of Fig. 6, and by following the process toward the left we see two of the four filling machines each capable of filling 72 to 90 bottles per minute with 0.5-horsepower motor each, two of the four crowning machines with a

one-horsepower motor each and an end view of one of the two pasteurizers with respectively 10-horsepower and 1.5-horsepower motors. The bottled beer after being pasteurized through six upward and downward passages in the pasteurizer filled with water at 180 degrees is removed from the other end in Fig. 7. Two of the four carryalls with a 0.75-horsepower motor each are shown in use, and two of the nine labelling machines with 0.25-horsepower motor each.

The labelling machines are placed between two of the circular carryalls and the bottles are taken from the carryall on the right, labelled and placed in carryall tray on the left. The packers then place the labeled bottles in cases and set the cases on the railway by which they pass by gravity to the first floor and out to the loading platform.

In addition to the above equipment other motor drives in the bottling department are a 7.5-horsepower motor on freight elevator, two horsepower on conveyor which carries empty crates from cellar to second floor; one horsepower on empty crate conveyor in cellar; one horsepower on filled-crate conveyor on first lift of the railway; two horsepower on hoist for pasteurizer trays; three horsepower on hoist for filled cases from first to third floors; two horsepower on barrel hoist, first to third floors; two 0.5-horsepower on two ventilating fans; 0.5 horsepower in machine shop; two horsepower on conveyor from front to rear of second floor and two horsepower on filled-case hoist second to third floors. The bottling department here has a capacity of 500 barrels, or 156,000 bottles per day.

Miscellaneous motor drives in other departments are: 7.5 horsepower on elevator in brew house; 7.5 horsepower on food chopper and one horsepower on horse-cleaning brush, both of these latter in the stables.

Inseparably correlated with the art of brewing and indispensably aiding at a great many points in the process, are to be found the ammonia compressors without whose assistance the business of brewing could not be conducted on its present enormous scale. In Fig. 8 may be seen the two new 125-ton vertical York ammonia compressors installed in the Globe Brewery belt-driven from two 250-horsepower motors.

Fig. 9 is a view of the engine room after the old equipment had been removed and motors installed and shows what may be done with electric drive towards eliminating bulky steam equipment and unsightly piping. The same is true of the pumping equipment which in its new forms is shown in Fig. 4. The latter shows, besides the attemperator, the beer and brine pumps, and air compressors already mentioned, a variable-speed, 25-horsepower motor-driven triplex pump for supplying water to condenser coils used in conjunction with compressors.

The important part played by the ammonia compressors is best realized when we consider their functions. First, they supply direct expansion refrigeration for the beer refrigerator coils, where the wort from the kettle is reduced to 41 degrees Fahrenheit to start fermentation. Second, they cool the brine which is circulated through the attemperator coils at 34 degrees Fahrenheit. Third, they co-operate with the attemperator coils by maintaining the fermenting room at the proper temperature. Fourth, they preserve the storage cellars at a suitable temperature of about 34 degrees Fahrenheit.

It is thus evident that the electrical load will be much higher during the summer than in the winter months, which makes such an industry a welcome addition to the central-station load. As for the benefits accruing to the customer, the eight months of full operation have already sufficed to demonstrate the fact that the saving in coal alone is almost enough to balance the cost of purchased electric power; this too, in spite of the necessity for continuance of steam generation from the boilers of the original plant to the extent of about 3.5 tons of coal per day.

Summarizing, we find steam to be required to heat the hot liquor for the mash tub, to raise the temperature of the wort in the mash tub, for boiling the wort and hops in the copper, for heating the water solution in soakers and pasteurizers, for the keg-washing process and finally for heating the entire group of buildings consisting of brewhouse, bottling house, office building and stables.

And the end is not yet in sight. Improvements are constantly being made and new applications of electric power are continually coming to light. Two four-ton and two two-ton electric trucks of General Vehicle Company manufacture are used by the Globe Brewery. These gave exceptionally prompt service in the recent Christmas and New Year periods of heavy business.

A second mash tub with the latest form of worm-gear drive from a 30-horsepower motor is being installed which will make a total of 800 horsepower, and a recent experiment with electric beer-vat heaters proved such undoubted superiority over the old charcoal method that the latter will be abandoned as early as possible.

The introduction of electric drive at the G. B. S. Brewery was simultaneous with the installation of the most up-to-date manufacturing and storage equipment and the placing on the market of the new Arrow Beer. The pro-

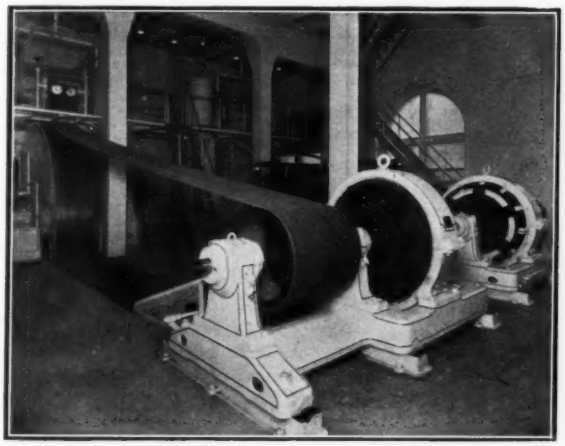


Fig. 8.—Ammonia Compressors in Old Engine Room.

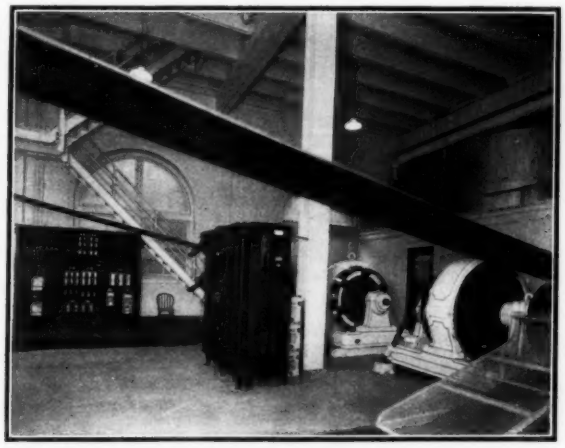


Fig. 9.—Switchboard and Motors.

duction of this beer by central-station power with such satisfactory results should serve to demonstrate to local industry of all characters the extremely versatile economy of which this method is capable, a hint which promises not to be without results judging by the number of local and out-of-town members of the brewing and electrical fraternity who have displayed an interest in the transformation.

The tabulation accompanying, although incomplete due to the comparatively short period of time during which the operation from central-station service has obtained, gives, however, an idea as to the division of power consumption which may be expected in an installation of this character.

RECORDS OF KILOWATT-HOUR CONSUMPTION.

Date	Ammonia Compressors	Miscellaneous Power	Lighting	Total	
Jan. 20th, 1913.....	.....	.....	....	5,040	Up to Feb. 1913, service was supplied only to small pumps, elevators, etc.
Feb. 18th, 1913.....	.....	.....	....	8,400	Bottling house started Feb. 1, 1913.
Mar. 20th, 1913.....	.....	.....	....	9,600	
Apr. 19th, 1913.....	.....	.....	....	34,860	Electric driven ammonia compressors started April 9, 1913.
May 19th, 1913.....	.....	.....	....	61,390	
June 18th, 1913.....	.....	.....	....	74,010	Separate meters for ammonia compressors cut in June 29, 1913.
July 19th, 1913.....	66,800	5,000	2,536	113,196	
Aug. 18th, 1913.....	110,700	7,960	4,081	122,741	
Sept. 19th, 1913.....	91,000	9,990	4,145	105,135	
Oct. 20th, 1913.....	59,000	11,520	3,308	73,828	
Nov. 20th, 1913.....	31,400	8,130	2,468	41,998	Submeters installed in bottling department Nov. 20, 1913.
					Bottling Dept.
					Lighting / Power
Dec. 20th, 1913.....	28,100	8,540	2,366	39,006	1,580 / 2,380
Jan. 20th, 1914.....	18,000	7,930	2,567	28,497	1,740 / 2,390

Commercial Practice
Management, Rates, New Business

Philadelphia Company Celebrates Twenty-fifth Anniversary.

The twenty-fifth anniversary of the founding of the Edison Electric Light Company in Philadelphia, Pa., was celebrated on March 12 at the Continental Hotel in that city under the auspices of the Engineering Department Branch of the Philadelphia Electric Company Section of the National Electric Light Association. There was an anniversary dinner at 6 p. m., at which there were short after-dinner talks by the executives of the company. W. C. L. Eglin acted as toastmaster. This was followed by a meeting at 8 p. m., which was attended by about 350. P. H. Bartlett and J. D. Israel, both told of the trials and tribulations of the early days just after the first Edison central station had been started. Short addresses were also made by President J. B. McCall, Vice-President W. H. Johnson and Manager A. J. De Camp. An original poem, written for the occasion, was read by B. Frank Day.

Medals of gold were presented to employees of the company whose names appear on the roll of honor, as follows: Joseph D. Israel, Thomas Tacey, Sr., George Broom, W. H. Johnson, James T. Maxwell, R. Frank Williams, James Gray, W. C. L. Eglin, J. Meikle Eglin, Charles Schiller, Timothy Foley, H. A. Koockogey, B. Frank Day, P. H. Bartlett, Frank Ruschmann, H. B. Seche, Charles Agnew, William Broom, T. H. Mumford, Bernard Dougherty, Charles Stasen, Harry Day, Charles Alcorn, William J. Lochart, Thomas Tacey, Jr., Patrick Neill, A. R. Granger, John Gallagher, Patrick O'Hara, Michael Mulvey, John Meyer, Patrick McCabe, Thomas Taggart, Herman Wenzel, Daniel Corcoran, John Christine, Ferdinand Becker and Charles Bennett.

Power Campaign in Manchester.

An effective advertising campaign calling attention to the advantages of motor drive in factories, is being carried on by the Manchester Traction, Light & Power Company, Manchester, N. H., with excellent results. This New Hampshire city is well-known as a great manufacturing center, and while some of the larger cotton mills have motorized equipment driven from their own generating plants, the central station is doing an increasing power business, not only in the city but also in the surrounding farming country, where motor-driven farm apparatus is being introduced by progressive agriculturists.

Safety First in Philadelphia.

The Philadelphia Electric Company has appointed a committee to further the "Safety First" movement among its employees. The chairman of this committee is H. C. Lucas. Instructions and information will be issued by the committee from time to time and an effort made throughout the organization to minimize accidents.

Report on Houston Rates.

The city of Houston, Tex., has had a report made by Lamar Lyndon and Henry E. Elrod regarding the adjustment of rates of the Houston Lighting & Power Company. The report recommends a reduction of about 40 per cent in the rates to small consumers and a graduated reduction of present rates to large consumers, together with a new rate schedule for power consumers.

In case these reductions are not accepted by the company, the mayor has threatened to start a movement for the establishment of a municipal plant, which it is estimated would cost in excess of $1,000,000.

Booklet of Salt Lake City Company.

The Utah Power and Light Company, with headquarters at Salt Lake City, has just issued an attractive booklet giving information on its electric service in the state of Idaho, which outlines the company's policies and gives the rates which it has recently adopted and filed with the Public Utilities Commission in compliance with the requirements of the public utilities law.

The application of the rates to various classes of business is carefully explained and considerable valuable information to customers is given.

Central-Station Conditions in Des Moines.

Some interesting statistics have recently come to hand regarding the growth of central-station business at Des Moines, Iowa. In 1912 the output of the Des Moines Electric Company was as follows: steam generation, 11,539,669 kilowatt-hours; water-power generation, 326,995 kilowatt-hours. The output during 1913 has run monthly about 20 per cent in excess of 1912 so that the total output in 1913 was approximately 14,200,000 kilowatt-hours, that is, including both steam and water. The water-power output during 1913 was less than in 1912 owing to the dry weather.

The customers numbered December 31, 1911, 5,963; December 31, 1912, 7,214; December 31, 1913, 8,835. The present retail rates are as follows:

For Business Houses:
10 cents per kilowatt-hour for that number of kilowatt-hours used each month, which is equal to the number of 25-watt lamp equivalents connected, and 5 cents per kilowatt-hour for all additional.

For Residences:
12 cents per kilowatt-hour for the number of kilowatt-hours each month equal to one-third of the 25-watt lamp equivalents connected, and 6 cents per kilowatt-hour for all additionsl.

Stated otherwise, this rate is about as follows:

For Business Houses:
10 cents per kilowatt-hour for one and one-half hours' use of the total connected load and 5 cents for all additional used.

For Residences:
12 cents per kilowatt-hour for one and one-half hours' use per kilowatt-hour of one-third of the connected load and 6 cents per kilowatt-hour for all additional used.

The last reduction was in the retail business rate, and was made July 1, 1913, and amounted to 16.66 per cent, the rate having been before then 12 cents and 6 cents per kilowatt-hour, and since 10 cents and 5 cents per kilowatt hour, the turning point being the same for one rate as another. This was a voluntary reduction. Quite as important a reduction was made in 1910, which was also voluntary.

The present capacity of the power house as installed is a rated capacity of 8,575 kilowatts in steam driven generators. The total peak load on the station in the fall of 1913 was 5,500 kilowatts.

The Illinois Traction Company owns and operates in the state of Iowa properties in the towns of Valley Junction, Colfax, Prairie City, Montezuma, New Sharon and Oskaloosa, all of which are managed from the Des Moines office. At present the company only supplies Valley Junction with current from the Des Moines station.

W. H. Thomson has been general manager of the properties since January, 1912. He was president of the Iowa State Electrical Association last year, and is now a member of the Executive Committee.

The company is contemplating building this year a transmission line from Des Moines to Oskaloosa, from which it will supply power to all the towns owned in the state. This will require considerable addition to the power house.

The business section of Des Moines is one of the best lighted commercial districts in the United States. This distinction has been gained through the popularity and energetic work on the part of the Des Moines Electric Company.

Block Lighting Plants Not Looked On With Favor in Kentucky.

Efforts are being made to restrict the operations of small electric light and power plants in Louisville and other Kentucky cities, which operate only in the blocks in which they are located, and are able to put up stiff competition to central stations covering the entire city. House Bill 285, which is now in the hand of the Public Utilities Committee of the lower house of the Kentucky Legislature, prohibits the sale of a franchise for a limited area, covering the sale of gas, water or electricity.

Mayor Buschemeyer, of Louisville, is opposed to the operation of block plants, terming them "undemocratic." He said, among other things, "The company that must supply everybody is forced to a certain extent to meet the competition of the block plant in the block where it operates. The cost of this competition is borne by patrons who do not live in territory supplied by block plants, because it postpones indefinitely the time when, by economical regulation and operation, rates all over the city could be reduced. It takes from the many to enrich the few. That makes it a special privilege. No company or individual should be given a franchise to use the public streets and alleys unless the service is to be given over the entire city."

Reduced Rates at Riverside, Cal.

The purchase of electrical apparatus and the use of electricity in Riverside, Cal., has been stimulated by the material reduction in the price of energy by the municipal lighting plant. The rates soon to take effect are as follows: domestic lighting, first 150 kilowatt-hours per month, seven cents per kilowatt-hour; next 100 kilowatt-hours per month, six cents per kilowatt-hour; all additional per month, four cents per kilowatt-hour. Power rates, domestic, first 500 kilowatt-hours per month, three cents per kilowatt-hour; all additional per month, two cents per kilowatt-hour. Pumping rates, first 100 kilowatt-hours per month, 1.5 cents per kilowatt-hour; next 100 kilowatt-hours per month, 1.4 cents per kilowatt-hour; all additional per month, 1.25 cents per kilowatt-hour.

Results of Electric Cooking Tests.

Some tests on electric cooking were recently conducted in Kansas City, Kans., under actual working conditions. The lighting plant there distributed several appliances among its patrons and requested that accurate records be kept of their performance. Three types of cookers were used: (1) Open heaters, such as frying pans, etc.; (2) ovens, containing heating plates, mostly inclosed, but not air tight; and (3) inclosed cookers, practically air tight.

The results obtained are shown in the table, the cost of energy being three cents per kilowatt-hour.

OPEN PLATES	
Frying half pound steak	$0.007
Breakfast of four eggs, fried, four slices bacon and two quarts of water boiled	.02
Breakfast for four persons—twelve pieces fried mush, six medium potatoes fried, four eggs fried, one and a half quarts coffee and one gallon of water to boiling	.06
Dinner—Nine medium potatoes, three fourths pound veal steak, one can corn, one quart water for tea, one gallon boiling water	.07
SEMI-INCLOSED OVENS	
Baked six large potatoes	$0.12
Four-pound roast and six large potatoes baked	.03
It is to be noted that the cost of cooking with this type is less than with the open plate.	
AIR-TIGHT COOKERS	
Four-pound roast, six large potatoes and one quart tea	$0.015
Boiled dinner—One small head cabbage, three pounds ham, boiling piece, twelve medium potatoes	.015
Two-pound steak, one quart spaghetti, twelve potatoes	.027
Three-pound pork roast, six large sweet potatoes, can corn, warmed one pound of fruit pudding	.027

New Advertising Co-operation at Byllesby Utility Properties.

More than 100 newspapers in cities where utility properties are operated by H. M. Byllesby & Company will advertise the Panama-California Exposition at San Diego in 1915 in connection with the regular advertising of the local utility companies. The Byllesby companies are constant users of newspaper advertising space and each of their advertisements for a period will carry the lines "San Diego Exposition—All 1915—San Diego, California" in a panel at the foot. This is the first time, so far as known, where a syndicate operating utilities in various parts of the country has utilized local advertising toward the success of a project in which one of the cities served is interested. The suggestion was made by H. H. Jones, manager of the San Diego Consolidated Gas and Electric Company. It will be carried out by 34 Byllesby operating companies serving a population of 1,500,000 without any special or additional advertising expenditure, and illustrates one of the many ways in which the syndicate operation of electric, gas and street railway companies may be made of indirect benefit to the communities served.

Electric Sign Data

Selecting an Electric Sign.

The "flexibility" of the electric sign as an advertising medium is almost without limit, but nevertheless care must be exercised in the selection of a sign, as the desired results will not be obtained if inappropriate designs are selected. The sketches which have been presented in this section for the past few weeks have been submitted in an endeavor to assist the prospect in selecting a design that would, in a measure, be fitting for the purpose at hand. Responsible manufacturers also are always willing to give the prospective customer the benefit of their information and experience, either directly or through the central-station company. The purchaser of an electric sign should always bear in mind that such advertising is unique in circulation in that everyone on the street must read it—day and night—and therefore considerable care must be exercised not only in the selection of the design and lettering but in the construction and erection. Substantial construction is, of course, a basic necessity. Better no sign at all than signs which appear flimsy or in which any danger lurks. Perhaps the greatest difficulty the conscientious sign salesman has to overcome is to persuade his customers that quality in construction is the basis of sign cost.

In a recent issue of *Signs of the Times* some valuable suggestions were made in regard to the points to consider in selecting a sign. It is stated that if it is the desire of the user of the sign that it serve also to illuminate the sidewalk and street, a raised letter will better serve the purpose. However, a raised letter cannot, as a rule, be read at as great a distance as can a grooved letter, nor can it be read at so great an angle unless the letters are made unusually wide and far apart.

A raised-letter sign is best where non-electric letters are also to be used. A few more lamps are necessary in the raised-letter sign generally, but this is not a large item.

If it is desired that the sign be read from a great distance, and if an exposed-bulb sign be desired, then the grooved-letter sign is most desirable. Also because of its more distinct outline, this letter can be read at an angle.

Of course, there are other signs besides the exposed-bulb signs. Manufacturers have produced some excellent results through prism signs, and some very beautiful effects are secured through this kind of a sign. The current consumption is necessarily lower where fewer lamps are used, and this is an advantage to the user of the sign, but not so great an advantage to the lighting company; however, it may be said to the credit of the lighting companies that the progressive ones promote both the exposed-bulb sign and the inclosed-bulb sign.

For roof signs the grooved-letter sign is generally more desirable in order that the sign can be read at a considerable distance.

Sign sketch submitted by the Greenwood Advertising Company, Knoxville, Tenn. This is a double-face sign admirably suited for opticians, etc.

Sign measures five feet wide by five feet high and contains 80 receptacles outlining the eye and the main border. The lettering is flat on a metal background. The eye is transparent. Any colors desired are provided.

Price of the sign complete is $100.

Central-Station Co-operative Sign.

An evidence of the co-operation between wide-awake central-station companies and at least their large customers is to be seen in the electric sign now hanging on the Van Buren Street side of the Fort Dearborn Hotel, nearing completion in Chicago. This hotel will be thoroughly up-to-date, and has contracted for all its electrical supply from the Commonwealth Edison Company. That company is justly proud of the contract and to boost the new hotel has hung a large sign, one and a half stories high, proclaiming:

Fort Dearborn Hotel
All Light Power
Elevator Service
Furnished From
Edison System.

The sign is made from the standard interchangeable letters of the Federal Sign System (Electric).

Electrical Construction

WISCONSIN ELECTRICAL RULES.

Hearing by the Industrial Commission of Wisconsin on Proposed Electrical Code.

The Industrial Commission of Wisconsin held a hearing in the State Capitol Building, Madison, on March 13, in regard to the proposed electrical code for governing installations in that state. This proposed code was printed in full in the issue of March 7, together with additional suggestions for lighting and power companies and industrial companies for formulating their own rules. The hearing was concerned only with the orders of the Industrial Commission, which it is proposed to make mandatory.

The tentative rules had been drawn up by a committee made up of representatives of manufacturers, power companies, electrical contractors and the Milwaukee Federated Trades' Council. After calling the meeting to order, C. H. Crownhart, chairman of the Commission, explained the purpose of the hearing and of the proposed orders, and called upon P. A. Schroeder, a member of the committee, to preside at the hearing. There were about 30 present.

The orders[1] were read in succession by Charles W. Price, assistant to the Industrial Commission, and comments were made by the various men in attendance at the hearing. Those taking part in the discussion included E. J. Hutchins, of the Western Union Telegraph Company; C. R. Phenicie, of the Wisconsin Public Service Company, Green Bay; William Bennett, of the Chicago & Northwestern Railroad and vice-president of the Association of Railway Telegraph Superintendents; R. S. Hartley, of Superior; L. H. Lathrop, of the Menominee & Marinette Light and Traction Company; H. E. Bloomer, inspector for the Milwaukee Board of Fire Underwriters; E. H. Kifer, of the Madison Gas & Electric Company; H. O. Seymour, of the Wisconsin Telephone Company; C. M. Jansky, of the University of Wisconsin; W. L. Smith, of the Badger State Telephone Company and president of the State Telephone Association; J. N. Cadby and P. B. Turner, of the Wisconsin Railroad Commission; and M. G. Lloyd, of the ELECTRICAL REVIEW AND WESTERN ELECTRICAN. C. H. Crownhart and J. D. Beck, members of the Industrial Commission, were present and participated in the discussion, as did also Thomas E. Barnum, W. F. Gute, S. B. Way and C. W. Price, members of the committee which drew up the tentative orders.

It soon became evident that the interests of the telephone and telegraph industries had not been very fully considered by the committee, and it was proposed that one or more members be added to the committee so that the problems involved in these lines of work might be adequately considered. Mr. Crownhart stated that the Commission would be glad to make such an appointment on the committee if the men interested would agree upon suitable representatives. Matters involving telephone and telegraph lines will be taken up fully by the committee at its own meetings, and consequently these matters were not fully discussed at the hearing. Objections were noted, however, to the fixing of 300 volts as the line of separation between circuits which should be considered dangerous and those not so considered. This was especially urged by Mr. Bennett, since there are certain telegraph circuits which slightly exceed this value. He urged the classification of circuits according to the use to which they were to be put rather than according to voltage. This point was also urged by Mr. Hutchins and it was stated that a considerable burden would be put upon the telephone companies in conforming with the orders as formulated. The representatives of the telephone companies pointed out that many of the regulations governing outside wiring would place a large amount of existing construction under the ban and pointed out that it would be almost impossible to comply with the orders. Mr. Smith and Mr. Turner especially emphasized these points and the lack of any need for such requirements in sparsely settled rural districts where there are no electric light or power lines.

There was considerable discussion as to where the line should be drawn between voltages which are dangerous and those which are not. While some objections were made to the value of 300 volts set by the committee, no definite suggestion was made for any other value. It was suggested that Order 601 be modified to include the suggestion as a sign of danger of the zig-zag line with arrowhead as a conventional representation of the lightning stroke.

With respect to Order 602, which provides for grounding the frames of generators, motors and transformers rated at 300 volts or over, it was pointed out that the National Electrical Code recommends the insulation of such frames up to 550 volts. This order will consequently conflict with the rules of the insurance companies and perhaps cause an increase in insurance rates. The fact that it is difficult to provide perfect insulation between the winding and frames of such machines was considered by the committee an argument in favor of this rule, since otherwise a shock might easily be received from such frames. Mr. Bloomer suggested that the voltage limit in this rule be raised to 550 so that the customary 440-volt motors would not be affected by it.

In connection with Order 603 regarding switchboard construction, it was suggested that the definitions of the words "switchboard" and "isolated" should be modified so as to make the application of this rule reasonable. The last sentence in this order regarding single-throw switches will be modified so as to permit mounting for a horizontal swing as well as vertical swing.

Mr. Bloomer suggested that Order 604, referring to clearance back of switchboards, should be made to conform with the rule in the National Code, but as the underwriters frequently make exceptions to this rule the committee did not deem it desirable to make the same provisions mandatory. Mr. Hartley considered this stipulation for clearance unnecessary where the wiring is on the front of the board.

In Order 610, requiring grounding of the neutral, it was stated that the committee intended grounding this neutral in the building on the load side of the fuse. Most companies already have the neutral grounded outside, so this would insure a grounded neutral whether the fuse was in place or not.

[1] These orders are given in full in the issue of March 7. In Order 616 the word "insulated" should read "uninsulated."

In connection with Order 617, requiring lightning arresters on all overhead circuits, there was some discussion as to whether this should be limited to circuits over 300 volts. Since a grounded neutral fills to some extent the function of a lightning arrester, it would be a hardship to require the latter upon low-voltage circuits. It was suggested that the provision for a copper ground wire be modified so as to permit an equivalent, as some companies prefer to use a galvanized-iron wire.

It was suggested that Order 618 be modified so as to require arc lamps to be placed at least 10 feet high instead of eight feet, as specified in the order; also that series arc-lighting circuits be permitted in car barns and certain other buildings, as well as electric generating stations; also that the limiting height be specified for arc lamps placed indoors in shops and factories.

There was considerable discussion with regard to Orders 619 and 627, fixing a limit to the length of span in outside wiring, but nothing definite was agreed upon. There is already a statute in Wisconsin requiring that at the crossing of railroad tracks spans shall not exceed 100 feet in length where the right of way permits.

Orders 620 and 621, referring to cross-arms, bracing, etc., will probably be modified to permit of customary practice on telephone lines. There should, however, be a definite precautionary rule applying to crossings between telephone lines and high-voltage lines. The question of cross-arm spacing will be further considered by the committee.

Mr. Turner suggested that Order 623, which refers to guying, be made applicable to new construction only, as otherwise it would require the rebuilding of many lines.

The wisdom of requiring insulation on high-voltage lines up to 5,000 volts, as specified in Order 626, was questioned, since it is well known that the weatherproof insulation usually used soon deteriorates so that it is not a protection against the line voltage. The expense, therefore, seems unwarranted and the apparent protection may be a source of real danger. On the other hand there is objection to the use of bare wire on account of contacts from swinging wires and as an additional hazard to wiremen, especially where green men are handling the circuits and are helped by the insulation to identify the different wires. Mr. Hartley objected very strongly to the use of bare wire on 2,200-volt circuits. He advocated strongly a greater clearance over roofs than that specified.

Mr. Cadby gave a summary of fatal accidents which had occurred during the past year, as compiled by the Railroad Commission. This showed more fatalities had occurred in the course of line work than from any other cause, viz., 9 out of a total of 30. Of these, seven resulted from a contact between telephone wires and power circuits.

In connection with Order 629 it was pointed out that there should be similar protection where telephone wires cross other circuits.

At the close of the hearing Mr. Hartley related a number of incidents showing how accidents had occurred due to the ignorance of wiremen and due to their being set at work under dangerous conditions. He thought responsibility should be placed definitely for seeing that wiremen are properly instructed in the work they are to do and the conditions under which they are operating, and also for seeing that such conditions are proper and safe.

It was announced that the committee would be glad to receive further suggestions in writing from anyone interested.

Illinois Contractors Select Special Representative.

At the January convention of the Electrical Contractors' Association of the State of Illinois a proposal to appoint a special representative to devote all his time to the work of the Association and visit contractors in all parts of the state was discussed and favorably acted upon. As a result, E. J. Burns, of Rock Island, has been appointed to this position and is now engaged in a campaign among contractors of that state.

A Model Operating Room for a Moving-Picture Theater of Moderate Size.

The extraordinary popularity of moving-picture displays has in the past few years directed close attention to safeguarding such theaters and particularly the operating room, which is the chief source of the fire hazard in such establishments and therefore, also, of the resulting danger to life. Nearly all communities of even moderate size have special ordinances regulating the installation and equipment of moving-picture machines, and the National Board of Fire Underwriters has drawn up regulations for the installation, operation and maintenance of such machines which are intended to reduce the hazards to a minimum.

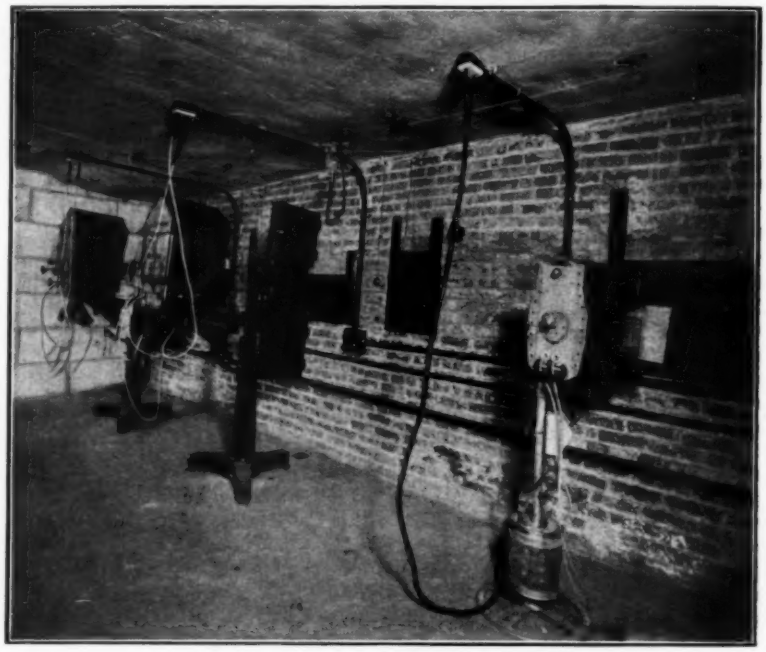


Fig. 1.—Operating Room of Moving-Picture Theater.

In a theater of this kind of considerable size the outlay for the equipment can, of course, be more generous than in a theater erected in a very small town or in the outlying district of a city. Nevertheless, even in the latter case, equipment of high character and a thoroughly satisfactory installation can be made at moderate cost, as is shown by the illustrations herewith.

These illustrations are from photograghs taken at the Windsor Park Theater, Chicago. This establishment is of moderate size and is located at Seventy-fifth Street and Railroad Avenue, which is in one of the outlying districts in the southeastern portion of the city. Although the theater is of medium size and has all its seats on the ground floor, it is a new establishment and thoroughly up to date.

The operating room, shown in Fig. 1, is the center one of a series of three rooms located directly above the foyer. To the north of it, that is to the left of the room as shown in this illustration, is a separate room for a powerful motor-driven ventilating fan. To the right of the operating room is a separate room, shown in Fig. 2. This contains the rotary converter for supplying direct current from the three-phase, 60-cycle, 220-volt alternating-current distributing system of the Commonwealth Edison Company; it also contains a control board for this machine and a switch and cutout cabinet.

The brick wall shown in Fig. 1 is the rear wall of the theater auditorium. The brick wall on the opposite side of the room has a convenient tool rack. The floor in the operating room is of concrete, the partitions between this room and the two adjoining rooms referred to are of tile, and the entire surroundings are made as fireproof as possible. The display equipment consists of two hand-driven Simplex motion-picture machines shown at the left in the illustration: there is also a spotlight shown at the right. The openings in the brick wall between the operating room and the auditorium are closed by gravity-operated steel sliding doors. These and the damper in the ventilating flue running up from the ceiling of the operating room can be held open by means of light fishline, in the manner prescribed, so that in case a fire breaks out in one of the film machines these cords will be destroyed and the openings immediately close. The bottom one of the three conduits shown along the brick wall carries the 220-volt supply circuit and runs to the steel cabinet shown at the right in Fig. 2. The upper conduit supplies the spotlight and also the first picture machine. The middle conduit supplies the further picture machine. The conduits are run to a point overhead each of the projecting arc lamps so as to make the flexible connection between the conduit outlet and its corresponding lamp as short as possible.

It had been intended originally to use a mercury-arc rectifier for obtaining direct current for the projecting lamps from the alternating-current supply; some of the equipment in the room shown in Fig. 2 was secured for that purpose. It was finally decided, however, to install a Martin five-kilowatt rotary converter instead of a mercury-arc rectifier. This machine develops direct current at 70 volts and runs at a speed of 1,800 revolutions per minute; it was supplied by the Northwestern Electrical Company, Chicago. The control panel directly above the machine contains a three-pole switch; it also contains a direct-current voltmeter. Mounted back of the panel is a transformer for reducing the 220-volt alternating current to an appropriate voltage so as to give 70 volts direct current after passing through the rotary. Above this are two grid resistances; one for each of the moving-picture machines.

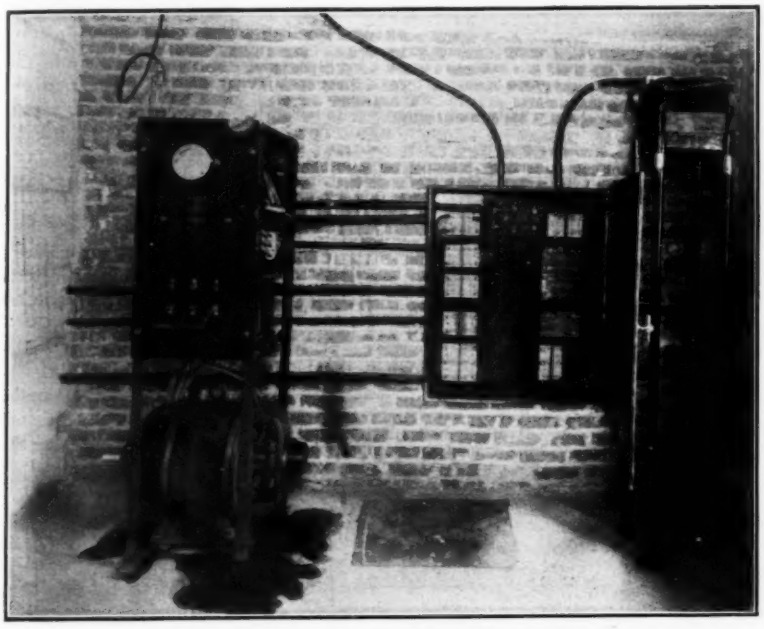


Fig. 2.—Rotary Converter and Control Boards.

In the steel cabinet shown in Fig. 2 there is a double-pole, double-throw switch at the top, by means of which the circuit for the projecting lamps can be thrown from the direct current supplied from the rotary to the alternating-current supply, the current in the latter case passing through the Compensarc transformer mounted on pipe standards and shown in the extreme right of Fig. 2; this reduces the alternating current to a suitable voltage for the lamps and makes it possible to run the lamps if something should happen to the rotary converter and thus make direct current unavailable. There is a switch for each lamp and also a main supply switch at the bottom. The switches ordinarily would be fused switches but there had already been obtained an equipment suitable for a mercury-arc rectifier, as mentioned above. Consequently the fuses for these switches were mounted on separate gear blocks without wasting any of the material already at hand. A circuit is also run from the alternating-current supply through a conduit that is shown curved above the cabinet and which leads to the ventilating motor.

The electrical installation was made by the contracting firm of J. L. Burgard, 753 West Fifty-fourth Place, Chicago.

Underground-Construction Department Organized by Freeman-Sweet Company.

If any evidence were needed of the extent of business and the enterprise of the Freeman-Sweet Company, Chicago, Ill., it is available in the announcement just made that a department for underground construction has been organized by the company. A number of jobs of this character have recently been executed by the company with much satisfaction to all concerned, and it was therefore decided to undertake such work as a regular branch of the business. This department will be in position to install any kind of underground and electrical lines, whether for transmission, light and power, telephone, fire alarm, ornamental street lighting or other purposes. Practically any kind of conduit construction will be undertaken and armored cable will also be installed. An interesting feature of the work will be the supply of competent cable splicers.

The Freeman-Sweet Company is fortunate in getting a most capable head for the new department in George L. Chamberlain. Originally hailing from New York City, Mr. Chamberlain early became associated with the Standard Underground Cable Company, of Pittsburgh, and for 18 years he retained his connection with that organization. He was engaged in underground construction work of all kinds and in all parts of the country. Starting in as cable splicer, he later became foreman and then superintendent of installation, his work being on some of the largest electric systems of the country. In 1911 he became superintendent of the underground cable and conduit department of the Chicago Railways Company and in the last few years he was engaged in installing for that company some 350 miles of underground cable in connection with the extensive rehabilitation of its street-railway lines.

LETTER TO THE EDITOR.

Static Charge on Belts.

To the Editor:

In the issue of February 28, Mr. N. G. Near states that slip on the pulleys and internal friction of the belt are the usual causes of static and to eliminate this slip and internal friction will also eliminate the static. It will be found that static is strongest at the middle of the belt and that where there is no slippage there is static. A belt moving rapidly through the air will cause static. It has also been found on systems where high pressure is used, that under certain circumstances parts of the system may be subjected to pressures very much higher than the normal. These effects, for want of a better name, are spoken of as being due to "static." They may be caused by any sudden change in the electromotive force of the system, as, for example, when a dead circuit is suddenly connected to live busbars, when a transformer is switched on to a circuit, when a circuit is suddenly cut off from the busbars, etc. These effects are not due so much to the static charges themselves, but to the fact that when a device is switched on to a circuit that is alive; a current wave at once tends to pass through the device and if this wave meets with opposition, pressures much higher than the ordinary pressure of the system may be set up; this is somewhat analogous to the case where a current of water is flowing rapidly through a pipe, there will be a certain pressure on the walls of the pipe, due to the head of the water, and this pressure will be practically constant. If, however, the flow of water be stopped by suddenly closing a valve in the pipe, the pressure will for an instant rise to a very high amount, producing the well known water-hammer effect. These sudden rises in pressure on high-tension circuits may result in puncturing the insulation of the transformer coils, armature coils, cable insulation, or other parts exposed to the high pressure. Take a case where a transformer is suddenly connected to a source of high voltage. The windings tend to become charged instantly, but owing to the self-induction of the coil, the current wave that tends to enter is choked back and a pressure may be set up between the various layers of winding that is very much higher than the normal.

The question of static is a serious one, especially on high-tension lines, and is such that it should be given consideration on almost all lines.

WILLIAM T. ESTLICK.

Seymour, Conn., March 9, 1914.

[The surges on high-tension lines, which are transient, should not be confused with the charges which accumulate, on insulators such as belts. The latter are believed to originate through the repeated contacts of different substances or through electrostatic induction, as in the common electrostatic machines.—EDITOR.]

Chicago Contractors Institute Inspection.

The Faraday Electrical Association, of Chicago, has instituted a plan which should have the effect of improving the general standard of electrical work done in that city, as well as being an aid to the members in determining the quality of the work which their wiremen install. The association has appointed three inspectors of mechanical work and is paying them for their time. These inspectors work under the auspices of the local union of electrical workers and make mechanical inspection of all installations of electrical work for which permits have been issued by the Department of Electrical Inspection. This consequently covers all work done in that city. This inspection covers mechanical details which do not come within the scope of the city's electrical inspectors.

The reports of the inspectors are turned in at the office of the Faraday Association and at the end of the month the results of these inspections are compiled and the various contractors are informed of the defects which have been observed in the work of their wiremen. This will give them an opportunity of knowing any deficiencies which may crop up so regularly as to indicate the need of special instructions to the wiremen, and will enable them to improve the general quality of the work done.

In the past few years under the severe competition to which different branches of the construction field have been subject, it has been necessary to specialize in our workmen to such an extent that their efforts have become mechanical. As soon as a trade or an occupation gets to the point where it is unnecessary to use the brain very much, the efficiency in the trade deteriorates to a point of day labor. This is the case in the particular line of work that the members of this association are engaged in, and it is for this reason that they have taken up the matter of mechanical inspection with the idea of rectifying this condition.

Westchester Lighting Company Consults Contractors.

The electrical contractors of Westchester County, New York, met with the officials of the Westchester Lighting Company on March 6 at Mount Vernon to discuss the proposed use of meter service boxes and to promote closer relations between the contractors and the company. There were about 75 men present.

W. L. Seacord, of the new-business department of the Westchester Lighting Company, called the meeting to order, and F. J. Murman, superintendent of the meter department, explained and demonstrated the service boxes.

The subject was discussed by Stuart Wilder; Edward C. Ruth; C. A. Kirchoff; Alfred M. Hitchcock; Mr. Schmidt, of Schmidt & Carl; Mr. Austin, of the Westchester Electrical Supply Company; Mr. Youmans, of Yonkers; and Messrs. Levene and Cooper, of New Rochelle.

G. E. Brauen, of the Suburban Fire Insurance Exchange, discussed the subject from the point of view of the underwriters. A collation was served at the close of the meeting.

Among the Contractors.

The electrical department of the Long Beach Improvement Company, of which E. P. Magoon is manager, has just established a store at 236 Pine Avenue, Long Beach, Cal., for the wholesaling and retailing of electrical supplies and fixtures, of which a complete line is carried. Mr. Magoon has been engaged in the electrical business for a number of years, and enjoys a large acquaintance among the trade.

The Seiffert Electric Company has opened a store in Henderson, Ky., in charge of O. P. Seits, and will handle electric appliances, heating apparatus and motors, and operate a shop for electric repair work.

Albert S. Reed, manager of new business for the Rutland Railway, Light & Power Company, of Rutland, Vt., and Fay C. Warren, of Middlebury, Vt., have formed a partnership under the name, Warren-Reed Electric Company. The new firm will do general electric wiring, making a specialty of conduit work and will handle electric supplies, fixtures and appliances of all kinds.

The Beaver Electrical Construction Company, of Chicago, Ill., will install three 120-horsepower motors in the Soo Terminal building of Chicago, Ill.

The contract for installing 1,000 lamps and a 14 horsepower motor for the Gradler Photograph Company, of Chicago, Ill., has been awarded to the Freeman-Sweet Company of that city.

The Peerless Electric Company, of Chicago, Ill., will install two 265-horsepower motors and a number of lamps in the plant of the Ravenswood Ice Company at 4716 Ravenswood Avenue, Chicago, Ill.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, Vice-President, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Engle, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Harman, O. E. Smith, New York City.

MEMBERS AT LARGE:
George L. Collison, Frank R. Daniel, James H. Fenton, F. G. Hartwell, J. E. Latta, James B. McCarthy, Thomas D. McColl, C. W. Mitchell, A. A. Moffitt, R. P. Strong

"LET THE CODE DECIDE."

"LET THE CODE DECIDE."

By Thomas Henry Day.

It is a frequent observation of today that one man's experience agrees closely with that of another engaged in a similar line of work. The writer has had considerable experience with the officers of several large corporations, operating in a number of communities, and is continually noticing that each of these corporations, while distinct and separate in corporate existence and operations, is in various ways benefiting by the experiences of the others. One agency through which this advantage of combined experience has been gained, is the interchange of ideas which are the outcome of thought and study on the part of well developed efficiency departments which these corporations have built up as a part of their systems; these departments having much to do with the success of the corporations, through the shaping of a definite policy and the establishing of a reasonable and intelligent standardization of methods.

May I digress for a moment to illustrate by a somewhat humorous incident the value of careful methods established in the clerical department of one of the companies I visit. It may help to present my view-point even though the point be somewhat obcurred.

I recently visited M. H. Mahoney, superintendent of the Franklin Electric Light Company, Turners Falls, Mass., where the following incident occurred.

It seems Mr. Mahoney's installation gang had completed a small job for a citizen of foreign extraction. The bill was sent, whereupon the customer appeared at the office with most praiseworthy promptness apparently, but as it turned out very much dissatisfied and displeased. He claimed that he had been charged for an item of work which he did not want done, had not ordered done and had no intention of paying for. Mr. Mahoney recalling his method of keeping accounts, as soon as he could get in a word, told his caller that the matter would certainly be adjusted, but that he felt sure that the bill was a true statement of the work performed and the materials used. This assurance did not appeal to the irate citizen who replied, "Your men did not cut a branch from my tree?"

"No," replied Mr. Mahoney, "my men did not cut any branches from your tree and we have not charged you for any such thing." "You have," exclaimed the excited man. "Well, let us see," calmly suggested Mr. Mahoney. Whereupon the bill (of which the following is an abstract with the prices omitted) was produced:

1	service cut-out .....
1	service switch .....
500	feet No. 14 rubber-covered wire.....
50	porcelain cleats .....
100	two-inch screws .....
1	branch cut-off .....

We will not go further with the bill as the customer pointed to the last item, and shouted, "See there! One branch cut off!" An explanation followed, the bill was paid and a satisfied customer secured. The point is there, as you will see on thinking it over.

Permit me now to approach the subject more directly. The person who accepts a standard and then consistently applies it, will find his operations in business to move much easier; and similarly an inspector who accepts the Code in its entirety will secure for himself a strong support in his attempts to obtain the carrying out of his requirements, should such be objected to.

For the judgments of an individual are not as good as the judgments of a number of trained minds, nor as a general thing, should the experience of one community be accepted when flying in the face of the combined experience of a commonwealth.

There have been, in a number of instances, departures from the requirements and suggestions of the Code, through the enactment of local ordinances and by-laws. It seems to me that if any municipality or department is passing through an experience for which the Code has made no provision, it would be a wise and an expedient thing to bring this new and perhaps unusual experience to the attention of the conference at which changes in the code are considered, to the end that the combined power of a number of minds may be applied toward correcting whatever unusual conditions the community has found to exist.

In my humble judgment this would be the wisest course to pursue, as I feel that it would surely bring about more good to us all because of the intelligent discussion by a large number of men, in addition to making the local department more effective.

In the preceding paragraph I made an effort to discourage local legislation on matters electrical, and to urge the acceptance of our slogan, "Let The Code Decide." Observe these points, one city of the country at one time differed from the Code in 115 points;

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

today it differs in but 18. In some instances the requirements of the Code have been changed to correspond with the city requirements, its requirements in these points being the needs of other cities. In other instances the requirements of the city have been changed to meet the experience suggested by the Code.

If the Code does not meet the needs of the time and place, if so reported to the proper source, together with all the facts which may be available, the Code will probably supply the need should such be shown to exist. In a word the Code represents the experience gained up to the time it was issued.

In a number of cities local ordinances have been enacted and have been found after trial to be faulty. Thus an ordinance was handed to me recently and my opinion as to its efficacy was requested. One section of that ordinance follows:

"All electrical wiring, electrical work and electrical apparatus in the basement or cellar of any building in both the first and second fire districts shall be completely incased in a flexible steel cable."

As to its mandatory limitations I leave my readers to draw their own conclusions, but would it not have been better in this case to have gone a little further afield and have sought advice before *enacting* that ordinance? Some such words as "and the standard of all electrical installations shall be that set up by the National Electrical Code," would seem sufficient when the framing of new ordinances becomes necessary. The inspection department of the city would then have a very wide field of experience behind it and would thus start out, strong in position and in the confidence of those citizens of the municipality who really know anything at all of electrical matters. Even in the consideration of ordinances and local legislative enactments, "Let The Code Decide."

There is one other point I would like to bring to the attention of our members and the electrical fraternity at large. From its inception, the National Association of Electrical Inspectors has accepted the Code as it has been promulgated. For a number of years we have been actively represented at all conferences at which proposed changes in the Code were considered, by an accredited and recognized representative in the person of our delegate, former president James E. Cole. At these conferences and committee meetings, when our association has asked him to present our views, he has done so, even when he may have argued personally on the opposite side of the question in our own meeting, exercising proper care to state that he was presenting the formally expressed view of the association as its delegate.

Thus through him we have enjoyed the privilege of having a part in the making of the Code, and hence we must accept the result of the work of the body in which we have been represented with such efficiency by our delegate, if we would be consistent and deal squarely with him and with the committee which allows us a voice in its deliberations.

At no time has this association made an effort to influence legislation concerning the Code, prior to the time of engaging in such legislation.

We have, of course, considered privately among ourselves numerous suggested changes a number of which we have presented to the Secretary of the Electrical Committee. Then when the bulletin of suggested changes has been received from him, we have, and not before, considered and discussed the entire bulletin, and thus prepared ourselves to take a position one way or the other on each question and if deemed wise to offer further suggestions when the proper time has come. I feel that it would be wrong, that it would be against the best interest of all concerned and very much against the purposes of our association to lead it or to allow it to be led, into an active and aggressive effort to influence matters which may be before a number of associations at a later date in any other way.

May I be permitted then finally to ask that all of us be consistent and judicious at this and at all times and until a change (no matter how much we may personally desire it) shall have been formally incorporated in the Code, both now and then,—"Let The Code Decide."

Secretary's Message.

President Day's article is not only timely but important, and expresses what should be the definite aim of all inspectors. It is interesting to remember that President Day is conversant with both municipal and insurance inspection methods and purposes. I think it should hardly be necessary in view of the remarks which have from time to time emanated from my pen in these columns, to say that I am in most hearty accord with the text of our president's remarks, "Let The Code Decide." Perhaps, however, as a municipal inspector I interpret it a wee bit differently. I think one, and a fairly obvious meaning, is that *no* inspector should ever allow his sense of authority to run away with him. Once in a while we find a tendency to require a thing to be done and not to admit the possibility of another interpretation of the Code. Still, in spite of the phenomenal arguments which we all meet so frequently, when the attempt is made to explain why an apparently obvious requirement has been disregarded, there are numerous cases where it is possible to find inspector and wireman looking at two apparently entirely different things. These upon calm reflection will turn out often to be only opposite sides of the same shield, and in such cases a little joint examination of the Code will often clear the whole matter up. If it does not, the question should be referred to the department chief.

We are all apt to make mistakes sometime, and an inspector will gain far more by a sweet reasonableness in trying to find out the other fellow's point of view, and being willing to admit the possibility of an error of ruling on his part than by standing pat on a decision perhaps open to doubt.

Now, however, when we come to consider the question, "What is the Code?", I think the municipal authorities are possibly not altogether wrong in desiring a little flexibility, and certainly should be very sorry to see such a clause as is suggested in Mr. Day's article in our own municipal law. "The standard of electrical construction and installation in this municipality shall be the rules and requirements of the National Electrical Code, except in so far as they may be modified by the ———, after due notice of the intended change and public hearing thereon, if such be requested," is better, for it gives legally the opportunity for change, if necessary, without a new by-law.

The National Electrical Code is intended to apply anywhere in the country and to large urban as well as small rural communities; obviously, therefore, it must strike a fair average of what can reasonably be required in the way of safeguards. It would be unreasonable to expect that it could completely meet all requirements of a city of the first class, and not at the same time be burdensome to the village town. We could not expect it to forbid absolutely, knob and tube work nor wooden moulding, though that may well be precisely the thing which should be done in a large city.

Take the case of the city mentioned and it will be found that many of the 15 variations are of a type which either find a logical reason as above, or else relate to points wherein we touch clearly upon a neutral ground where the electrical questions meet and interlock with the clear interests of other departments, or where pole locations, wire heights, underground work, etc., must be adjusted to the particular case.

To illustrate, think of a bath room.

Say A is at the head of the department. Suppose A knows that even a low voltage alternating-current circuit may give a person, C, a serious shock through damp hands or feet, and, that C has certain heart conditions, even serious ones. If A says knowing this, "I deliberately allow fittings to be so located that while touching any of the toilet arrangements a person can come in contact with a wire supposedly innocent, and if a ground exists, able to cause him personal harm," then A certainly is liable to C. So is the municipality whose agent A is, since C proceeds to use the installed apparatus in the innocent belief that A has exercised his authority to protect him from danger to the best of his knowledge and the state of the art which legally A is supposed to know.

Accordingly A adds a requirement that in bathrooms and other rooms of the house where similar risks may be run, that keyless sockets or receptacles must be used, located out of reach of grounded fittings; except in special cases where permission is given to do otherwise for clearly reasonable causes, and invariably controlled by a double pole wall switch.

Again, B finds by experiments extending over considerable time that in his municipality, a large part of which lies along the bank of a slowly flowing stream which flows partly through meadows and flat bottom lands, that at certain times of the year local meterological causes produce fogs from the stream. These fogs he knows to be laden with somewhat chemically active emanations, which, without question, do attack joints in the wires and cause a slow progressive deterioration since these fogs occur concomitantly with very hot muggy days and damp chilly nights.

Accordingly, within certain areas B requires additional protection of joints, by an insulating paint carried back a certain distance along the wire.

I certainly do not think we should carry the American obsession for uniformity,—that same obsession which leads so many manufacturers to the "that's our standard design, take it or leave it" position, which coupled with an easy going, avoid bother temperament on the customer's part, is responsible for the painful disappearance of many a British Thermal Unit between furnace and switchboard, speaking only of one case. No two cases are precisely alike and though fortunately a very large majority are nearly enough so to fall into the same category, we should not, I feel, carry standardization so far that we run into a difficulty of overstandardization which is as bad and worse than none at all.

Up to recently as we know, the National Code has been essentially and definitely a fire code for obvious, entirely proper, and logically unquestionable reasons. Yet I feel that the builders of the Code were not unmindful of the other side and went as far as they could to protect against personal harm and would gladly have gone further could they have defended their position as fire insurance organizations, if an ingenious legal adviser had chosen to attack it.

This inevitably compelled municipal departments to modify the Code in some ways, which of course was recognized by intelligent officials as a more or less regrettable necessity.

Now we have a changed state of affairs and good reason to believe that before long we shall see the life and health risks formally given cognizance in the Code. Then one great argument for deviations therefrom will have vanished and any ordinary municipality will have to be extremely sure of its ground in enacting any such into law, if it wishes to avoid the appearance of merely wishing to show that it is "a free self-governing American community 'by heck'!" which does not propose to have any "fellers from such and such a place telling us how to run our town."

Seriously then, the time has come when it is entirely proper to expect that all over the country the National Electrical Code will form the basis of and supply the details for every Code which may in any way be made a part of the municipal law. It should be accepted in its entirety in the vast majority of cases, in others not a change should be made without the most serious and thoughtful consideration from all points of view. All interests should be consulted and if it be apparent to the majority that the modification is really of such reasonable degree of importance as to justify the taking of such a serious step, the modification will be justifiable in most cases.

Thus if we take of the Code of New York City, we find it has been recommended for adoption by an advisory board of six engineers, three representing the City and the other three being, F. J. T. Stewart, superintendent of the survey bureau, and J. C Forsyth, chief electrical inspector, of the New York Board of Fire Underwriters and George E. Bruen, superintendent of the electrical department of the Suburban Fire Insurance Exchange.

Certainly when a municipality can show that any changes it makes in the Code have passed through the hands of three men such as these, it may feel justified in its action and the rest of us will have confidence in the wsdom of the changes which were made for clearly local reasons.

Neither do I feel that any cavil would arise in any other case should a municipality present an equivalent in the way of expert authority for its action, *but in the absence of something like this, a municipality is extremely unwise, injudicious and open to just criticism if it does not simply accept the Code as it stands.*

Finally, once the Code is adopted every official working under it should be loyal to it, enforce its requirements uniformly, equitably, and to the best of his ability. If he sees points wherein he thinks it might be improved, it is his duty to present them to his superiors with his arguments and then let his suggestions pass through the routine course. But *publicly*, outside the office, it is his business to enforce the Code as it is given into his hands. It is unwise, a weakening of authority (for which we have none too much respect in this country), and altogether improper for him even to hint that Section X is in his opinion rather nonsensical, or that really it is his idea that fitting Y, even though not on the approved list, is just as good, possibly better, than fitting A which is found on it. It hardly seems as though this would occur, but it does as I personally know and it is very regrettable.

But I am afraid I have already said too much and only wish to add that these are merely my personal ideas, and I am not at all afraid to change them if necessary and to explain why. Any member of the association is perfectly at liberty to get out his hatchet. If he will write out his criticism and send it I shall see that the Secretary prints it. "Let The Code Decide."

Control for Three-Phase Motor.

Question 257. A branch circuit leads from a 220-volt three-phase service to a one-eighth horsepower, 220-volt three-phase motor, one wire leads straight through, the other two are broken by two double-pole switches placed in parallel so as to control from two points. Is this allowable?

Answer 1 (U). Yes, if switches are in sight of motor.

Answer 2 (W). There is no rule prohibiting.

Answer 3 (A). Nothing in the Code touches it specifically. I should like to see all three wires interrupted entirely killing the motor when not in use.

Answer 4 (H). I should say it was allowable.

Answer 5 (P). Yes. Since under Rule 8*c* single-pole control is allowed on motors of one-quarter horsepower or less, I do not see why the Code should be interpreted to require *all* the leads to a motor of this type and size to be broken.

Answer 6 (O). Yes, rule 8*c*. Of course, you could not use a single pole switch on a three-phase motor, but a double pole would violate neither the spirit nor the letter of the requirements. The use of two as suggested is unusual, but does not seem objectionable nor in violation of the Code.

Answer 7 (E). I do not know that the point raised is treated in the Code. Personally, however, I would prefer that all three phases passed through the switches.

Answer 8 (Q). This would be permissible under rule 8*c*, last paragraph.

Answer 9 (T). If a motor of the size and type specified is on the market, rule 8*c* will permit these switches.

Answer 10 (J). Rule 8*c* permits single pole switching for small motors, of the voltage given. I should consider the given case in the same light and approve the use of the double-pole switch. I see no objection to the use ot two in parallel provided each is in sight of the motor or permission has been secured to place them elsewhere.

Answer 11 (D .) The arrangement suggested is all right provided the third line is grounded, otherwise should use a three-pole switch.

Answer 12 (S). Yes, I think that this would come under rule 8*c*.

Answer 13 (B). As motor is less than one-quarter horsepower it is not necessary that controlling switch should open all wires and method suggested, considering capacity of motor, would be permissible.

Answer 14 (N). The only rule which touches this is rule 8*c* by analogy. The wiring is entirely proper and the only danger I can see is the possibility of one lead to the motor being alive if transformer insulation fails. This always leads me to give *advice* to open all three wires on three-phase motors, as these are mostly delta connected as is also the distributing circuit, and you cannot get a neutral point to ground without special devices.

Grounding Low-Potential Circuits.

Question 258. In a three-phase system, should the ground wire be of the same size as the line wires, when these are smaller than No. 6 B. & S. gauge?

Answer 1 (U). In alternating-current circuits ground wire never smaller than No. 6.

Answer 2 (W). Rule 15*d* ground wire never less than No. 6. This is clear for all alternating-current circuits.

Answer 3 (A). No. Rule 15*d* answers this question fully.

Answer 4 (H). No. Rule 15*d* provides ground wire must never be less than No. 6.

Answer 5 (P). Rule 15*d* requires ground wire in alternating-current systems must never be less than No. 6. I do not see why this question should be asked.

Answer 6 (O). Rule 15*d* provides that the ground wire on alternating-current systems shall never be less than No. 6 B. & S. gauge.

Answer 7 (E). The last sentence of rule 15*d*, first paragraph, is not changed in meaning by the language of the second paragraph of same section. If the line wires are smaller than No. 6, the ground wire must be No. 6. If they are larger than No. 6, the ground wire must have capacity equal to any one of them.

Answer 8 (Q). A ground wire having a carrying capacity equal to circuit would comply with the rule.

Answer 9 (T). No. Rule 15*d* places the smallest allowable as No. 6.

Answer 10 (J). The ground wire must not be smaller than No. 6. This general requirement is not annulled by the paragraph which follows, which is evidently meant to apply to cases where the mains are larger than No. 6.

Answer 11 (D). Ground wire is to equal in carrying capacity the main to which it is connected.

Answer 12 (S). Rule 15*d*. Ground wire must never be less than No. 6 B. & S. gauge.

Answer 13 (B). The ground wire must never be less than No. 6, no matter what the size of the mains may be.

Answer 14 (N). It must be at least as large as No. 6 B. & S. gauge. The wording of the next paragraph in rule 15*d* refers to circuits larger in size than No. 6. It is also, I have always thought, intended to cover the two cases of lines of equal power, either delta or star fed, the line currents differing in these cases.

Chicago Has Permanent Building Exhibit.

The entire second floor of the Insurance Exchange Building, of Chicago, Ill., is being devoted to a permanent and co-operative display and market of building materials, supplies and fixtures. The object of this exhibit is to interest and acquaint architects, contractors, builders, and subcontractors with the best of materials, supplies and devices known to the world. Efforts will be made to reach and interest in this exhibit all persons obtaining building permits in Chicago and in the principal cities of the Middle West. In this way the exhibit hopes to be of service to both the manufacturer and purchaser.

Almost a hundred companies have already taken space in this exhibit. Among these are several electrical firms exhibiting washing machines, vacuum cleaners, etc. By far the most complete and interesting of all exhibits is that of the Commonwealth Edison Company, which includes not only an exhibit of wires, wiring devices, and heating and cooking devices, but also a miniature house fully wired and equipped with modern lighting units, electric washers, vacuum cleaners and heating and cooking devices. The Burdette-Rowntree Manufacturing Company has an interesting demonstration of electric dumb waiters and a pneumatic elevator-door-closing device which automatically prevents the movement of an electric elevator until the doors are fully shut. Another interesting exhibit is that of Thomas & Smith, Incorporated, which shows the application of electric motors to sewage ejectors and other pumps.

Wilkes-Barre Contractors Win Victory in New Code.

The City of Wilkes-Barre, Pa., under the commission form of government, has adopted a new building code. A special committee of architects, builders and engineers, including a representative of the Wilkes-Barre Electrical Contractors' Association, was in conference on this matter for over a year.

This code, which is now a law, forbids the use of knob-and-tube work in any section of the city, requires metal outlet boxes and metal receptacles for wall switches, main switches, cutouts, panelboards, etc. The code also requires the annual registration of all firms, corporations and individuals engaging in the business of electrical wiring for light, heat and power.

Public Service Commissions

Conducted by William J. Norton

COMPETITION IN NEW JERSEY.

A recent decision handed down by the New Jersey Board of Public Utility Commissioners, approved an ordinance passed by the common council of Phillipsburg and thereby authorized a competing electric utility, the Phillipsburg Light, Heat and Power Company, to be established in the town of Phillipsburg, N. J., where the Eastern Pennsylvania Power Company had already established service. This is the only instance in which the Board has decided in favor of admitting competition and the decision may be criticized in the light of the Board's former rulings on the question of competition in the public utility field and also in the light of the well established precedents of other commissions.

In this article Mr. Norton presents a comprehensive resume of the decisions which have been handed down by the public service commissions in the various states, relating to the matter of protecting established utilities against unnecessary competition. In the summary he indicates what apears to be a reasonable commentary upon the New Jersey Utility Commission's action in the Phillipsburg case.

THE NEW JERSEY LAW.

The application in the Phillipsburg case is one coming under the following provisions of the New Jersey public utilities law.

"No privilege or franchise hereafter granted to any public utility as herein defined, by any political sub-division of this State, shall be valid until approved by said board, such approval to be given when, after hearing, said board determines that such privilege or franchise is necessary and proper for the public convenience and properly conserves the public interests, and the board shall have power in so approving to impose such conditions as to construction, equipment, maintenance, service or operation as the public convenience and interests may reasonably require." (Sec. III of Chapter 195 of the Laws of 1911, paragraph 24.)

The Supreme Court of New Jersey has defined the Board's power under this statute upon an appeal of the Eastern Telephone and Telegraph Company from the Board's decision barring the company from furnishing competitive service under franchises granted by Cape May County and the Borough of Avalon.

The court has decided that the Board's power is not limited by statute to supervising the execution of the permission and consent granted by a municipality, but that the Board has a right to refuse to approve franchises granted by municipalities where it is deemed that the utility is not necessary for public convenience.

POLICY OF THE COMMISSION.

In the Phillipsburg case the Board cites the following cases as showing the position of the Board in the matter of utility competition locally: Atlantic Highlands case, Vol. 1, 7; Consumers Gas Company of Millville, Vol. 1, 650; Eastern Telephone and Telegraph Case, Vol. 1, 733; and the decision of recent date in the matter of the petition of the New Jersey Power Company for authority to issue stock.

Atlantic Highlands Gas Case.

In the first mentioned case, the Board is asked to approve a franchise passed by Shrewsbury township granting the Atlantic Highlands Gas Company the right to furnish gas to residents within this township. The Consolidated Gas Company had been furnishing gas in this territory for a number of years and at the time of the application of the Atlantic Highlands Company was laying pipes and making other preparation for serving practically the same section of the township the applicant desired to enter. Under the circumstances in this case the Board decided against competition discussing the question as follows:

"In the case of ordinary industrial concerns competing or desiring to compete in serving the public, the traditional presumption is in favor of permitting such competition. That the consumer, under ordinary circumstances, has some considerable guarantee of fair prices and adequate service by diverting his patronage to an alternative seller, is incontestable. This presumption, however, commonly fails in the case of public utilities operating under franchises. Experience has gone a long way towards demonstrating that services afforded by public utilities tend eventually to be rendered under conditions of monopoly. It is true that for a time a public utility may compete with another supplying the same body of consumers with the same service. But experience demonstrates that such competition is likely to be short lived. The two competitors are influenced by the considerations of securing higher prices by the mutual concellation of their competition, and not infrequently by the possibility of reducing costs by a union of parts of their productive apparatus. Where actual fusion of the two erstwhile competing concerns does not result, a division of territory or joint agreements as to rates, prices or service not uncommonly operate to leave consumers at the mercy of a virtual monopoly. The low prices prove but temporary, and the transient gain is succeeded by a long period of loss. That public opinion has come to recognize the almost inevitable outcome of such temporary competition between public utilities is evidenced by much recent legislation. The creation of various boards and commissions with supervisory powers over public utilities, and often with eventual powers of rate-fixing, demonstrates that **the illusive doctrine of competition in this field is being superseded by an experimental regime of strictly regulated monopoly.**

"Two other influential considerations operate in the same general direction. Where competing companies, with franchises, serving the same consumers, finally unite, the unnecessary duplication of plant and appliances entails a permanent burden upon the public. Even where prices, after due hearing, may be prescribed by public authority, some regard must be paid to the interests of bona fide investors. The prices set must have some reference to the capital legitimately sunk in the equipment of the formerly competing plants. It not infrequently results that the prices eventually authorized are higher than they would need to be, if no more than the necessary amount had been originally invested in plant and appliances adequate for the supply of consumers. **Thus the evils of an ill judged competitive experiment in a field unsuited therefor perpetuate themselves and burden the consuming public.**

"It is hardly necessary to add that the unnecessary installation of pipe, conduits, mains, wires, tracks and the like by two competing public utilities in the same region augments unwarrantably the disturbance of traffic through the public thoroughfares, and creates gratuitous nuisance.

"Those general propositions would seem to require strong countervailing considerations in the particular case under review if the Board is to approve the ordinance passed by the Shrewsbury township committee on

November 17, 1910. It is true that conditions may exist in particular cases which might warrant such action. If the Consolidated Gas Company had been shown to be totally devoid of enterprise, and were now reluctant to extend the supply of gas into the parts of Shrewsbury township which the Atlantic Highlands Gas Company stands ready to supply, or if the service of the Consolidated Gas Company had been shown in the past, or in the present, to be inadequate; or if there was such disparity in prices and quality of service offered by the two companies that the exclusion of the Atlantic Highlands Gas Company must result in subjecting possible consumers in Shrewsbury township to hardship, extortion or poor service; or if the Atlantic Highlands Gas Company could demonstrate that it alone of the two companies commanded processes or methods which promised pronouncedly better service or lower prices than the Consolidated Gas Company, there might be ground to question the applicability of the general principle of regulated monopoly to the case at issue.

"The Board of Public Utility Commissioners cannot discover that such exceptional circumstances exist in the present case." (Vol. 1, 9-12.)

The decision in the Atlantic Highlands gas case has been presented at length as it is the first ruling of this Board on the question of competition and affords the basis for later decisions on applications involving competitive service.

Millville Gas Case.

The Consumers Gas Company received an ordinance from the city of Millville and applied to the Board for its approval granting the company the right to furnish gas service in competition with the Millville Gas Light Company. The Board was asked to reconsider its decision in the Atlantic Highlands case on the ground that it is in conflict with the constitution, the common law and the statute laws of New Jersey, especially Chapter 16 of the Laws of 1913 and that the reasoning upon which the decision was based is erroneous.

Chapter 16 of the Laws of 1913 was enacted subsequent to the statute creating the board.

The second section of this statute is as follows:

"Any person, or persons, being officers, directors, managers, or employees of any corporation or body who shall wilfully use, operate or control said corporation or body politic, or suffer the same to be used for the furtherance or promotion of any object, fraudulent or unlawful, under the laws of this state, or who shall use the same directly or indirectly in restraint of trade or in acquiring a monopoly when such corporation or body politic engages in interstate or intrastate commerce, shall be guilty of a misdemeanor."

The Board holds that this section lays a prohibition upon the officers, directors, managers or employees, prohibiting the use of any corporation in restraint of trade or in acquiring a monopoly. but that it in no wise lays any restriction upon a municipality or upon the Board in the exercise of powers vested by existing statutes.

"We have examined with care the provisions of the Constitution and statutes of the State to which we have been referred as indicating that the policy previously announced by the Board contravenes the settled law of the State. We find nothing in the constitution or statutes to justify this contention or to require the reversal of the position previously taken by the Board."

The Board then upholds its decision in the previous case in the following manner:

"The excerpt from the Atlantic Highlands case, it is averred, shows faulty reasoning. Higher prices by mutual cancellation of competition; union of productive apparatus owned by competitors, and a consequent reduction of costs; division of territory, and transient low prices; all these, urge the petitioners, are now impossible without the knowledge and consent of the Board. While this is true, it is not unfair to remark, in passing, that the excerpt quoted from the Atlantic Highlands case is not exclusively confined to 'reasoning.' It is, in part, history—history of what commonly happened, before the regime of regulation was instituted.

"The Board, moreover, is convinced that so much of the excerpt as emphasizes the unnecessary duplication of apparatus, and the permanent burden it imposes on consumers, where competition is allowed without being required by the public convenience, or without conserving public interests, is sound, and is unshaken by any consideration as yet adduced by the petitioners.

"In general, then, the Board holds that the decision reached in the Atlantic Highlands case was first strictly legal, not in conflict with the common law, or with the statutes or the constitution of this state, and, second, that it is in line with wise public policy." (Vol. 1, 655-656.)

The application of this policy to the Millville case is then carefully considered. Will public interests best be conserved by permitting a competitive company to enter the field? Testimony is offered to the effect that the present service is inadequate. The Board points out that there are "certain factional differences" existing between the supporters and opponents of the applicant company and that allowance must be made for such "individual bias as individual testimony may disclose." From the testimony it appeared that there were not more than 50 houses out of a total of 3,037 houses in the city which were not supplied with gas by the present company. In conclusion the Board says:

"Apart from the fact that the price of gas at Millville is certainly as low as in any place of similar size in this State, supplied by a local plant; apart from the fact that the physical apparatus in place is adequate for the complete supply of gas even at peak load, and at standard pressure, in all parts of the city at the present time; apart from the fact that a competing company in Millville must excavate miles of street to the inconvenience, at least temporarily, of the inhabitants, **the approval of the franchise in question would threaten or seriously impair the legitimate investment now existing in the works and mains of the Millville Gas Light Company, and by implication every investment similarly circumstanced in this State. Such impairment cannot be said to conserve the public interests. Bona fide investments in a public utility affording good service at a fair price are an essential part of the public interests."**

The application was denied.

Eastern Telephone and Telegraph Case.

The Eastern Telegraph Company applied for the approval of ordinances granting it the right to furnish telephone service in Cape May County and the Borough of Avalon in competition with the Bell companies operating in the territory in question.

It was contended that to deny the petitioner the right to take on new subscribers in Avalon will lessen and impair the value of the service to the petitioner's existing subscribers, and will inure to the benefit of the Bell companies.

"The Board has already put on record its conviction that the State by statute should require competing telephone companies to afford physical connection for proper toll charges over their respective lines. If this were done the refusal to allow a rival company to enter a place already served by another company would avoid the waste of duplicating plant and would secure the widest area of service possible . . . " (Vol. 1, 742.)

The Board withheld its approval of the ordinance protecting, in each case, the company installed, although it did not have the power to order physical connection affording the interchange of service necessary to provide complete telephone service.

In the cases just cited, the Board has established the policy of protecting utility companies from competition unless "strong countervailing considerations" in a particular case overrule the general and fundamental proposition and make competition under such individual circumstances best serve public interests.

In the Millville gas case, the Board has defended its right to carry out such a policy and its right under the statute has been upheld by the Supreme Court case cited above. Furthermore, the policy which the Board has outlined in these decisions is in line with the well established principles of the New York, Massachusetts and Wisconsin Commissions.

POLICY IN NEW YORK.

The policy of the New York Commissions may be best illustrated by the following paragraphs taken from the Long Acre Electric Light and Power Company case. (Vol. 1, 1st D. N. Y. p. 226, 247-254.)

"The whole electric history of New York City points the futility of competition. In the early years of the industry numerous companies were organized. From time to time these were absorbed, only to be followed by new companies frequently encouraged by the city with the idea that competition was the life of trade, and that the more competition there was the better would be conditions. But the same procedure occurred again and again. The new companies were merged or swallowed up, until at the present time there are but two electric supply companies operating in Manhattan, and these two companies, although nominally independent, are owned and controlled by the Consolidated Gas Company . . .

"In the first place, the existence of competing companies necessitates constant opening of the streets to provide service connections to the houses and street mains for the distributing wires . . .

"Competition also involves duplication of generating plants and substations. Each must provide sufficient plant not merely to supply the peak of the load, but to meet any accident which may occur. Machinery must at all times be held in reserve, and when there are several independent companies, no one of which may take a momentary advantage of the reserve of the other, they all must maintain reserves very much in excess of what one company must keep, where it may fall back upon any and all of its stations to meet a failure at one of them. Again, it is well known that one company can generate current for the whole of Manhattan much more cheaply than can several companies, each one of which undertakes to supply the entire borough. Further, the loss due to distribution is larger where there are several systems.

"The result of such duplication of capital and the less economical methods of production and distribution is, that the cost of delivering current to the consumer is larger under competition than under efficient monopoly. It may be, and often has been, true that competition has temporarily lowered rates and improved service, but this does not controvert the statement that the cost to one company of current is less than the cost to several. Competition has forced price nearer to, or below, cost for the moment, but everyone knows that when the rate war has ceased, due to agreement or merger, prices have gone up, and the consumer ultimately has paid the bill, and has continued to pay interest and dividends upon duplicate capital unless the state has stepped in . . .

"The applicant has not proved that the existing companies are not properly conserving the public interest and convenience, and that it would be to the advantage of the community to have a new company authorized to enter the field . . .

Similar decisions were made in the following cases by the New York Commission, 2nd District:

In re Appl. Lockport Light, Heat and Power Company, 1 P. S. C. Reports (2nd Dist.), 12; in re Appl. Kotonah Lighting Company, 1 P. S. C. Reports (2nd Dist.), 46; in re Bath Citizens Electric Service Company, 1 P. S. C. Reports (2nd Dist.), 336; in re Appl. Buffalo, Rochester & Eastern Railway Company, 1 P. S. C. Reports (2nd Dist.), 532.

POLICY IN MASSACHUSETTS.

In the Worcester Electric Light and Power Company case (Annual Report 1894, 23-26), the Masssachusetts Board of Gas and Electric Light Commissioners says:

"The evidence as presented to the Board seems to afford no reasonable ground for the expectation that the proposed company could afford its lights for less than the existing company . . . It does not possess and probably does not expect to acquire the exclusive control of any invention by which special saving in cost may be effected, and it cannot reasonably be expected to possess any higher technical or business talent than lies within the reach of the existing company.

"It is the duty of the board and its only purpose to secure to the people of Worcester, so far as it lies within its power, the best service at the lowest reasonable price. There is some reason to believe that the admission of the proposed company might seriously impede, perhaps wholly defeat, this object. It must be recognized that both companies are to be promoted and to be conducted for the sake of profit, and that they will be governed by the same laws as other companies in similar business . . . The history of corporations doing an electric lighting and similar business in competition in various parts of the country affords strong ground for believing that a new company, if allowed to engage in business, would not long remain by itself, as competition for a period would probably be followed, as elsewhere, by consolidation or absorption . . . But combinations, and consolidations, as is well known, affords the opportunity and usually a temptation to stock development too great to be resisted. Such needless outlay should be avoided and saved, for when it has once been incurred, or the money expended in an enterprise not required to supply the public wants, so great is the expectation of gain, and so persistent and unyielding the demands of capital for dividends, the remedy is not then easily found or applied, and the better policy avoids the evil at the outset by preventing the expenditure . . ."

The following are additional cases covering the same point:

Chelsea Gas Light Company, Annual Report 1891, 17; Chelsea Gas Light Company, Annual Report 1895, 8; Boston Edison Illuminating Company, Annual Report 1895, 17; Great Barrington Electric Light Company, Annual Report 1895, 19; Rockport Electric Light, Power and Heating Company, Annual Report 1896, 8; Easthampton Gas Company, Annual Report 1908, 32; Fitchburg Gas & Electric Light Company, Annual Report 1910, 50; Newton Gas Company, Annual Report 1889, 77; Boston Edison Electric Company, Annual Report 1895, 14; Stoneham Citizens Gas Light Company, Annual Report 1890, 91, 92; Clinton Gas Light Company, Annual Report 1890, 93; Roxbury Electric Light Company, Annual Report 1890, 98; Dedham & Hyde Park Gas & Electric Light Company, Annual Report 1890, 102; Middleboro Electric Light & Power Company, Annual Report 1890, 104; Marlboro Electric Company, Annual Report 1893, 14; Haverhill Electric Company, Annual Report 1908, 20; Worcester Electric Light Company, Annual Report 1910, 55 (2nd application).

(To be continued.)

ARIZONA.

Minimum Charge. The Corporation Commission has given notice of a general hearing in the matter of minimum charge for gas and electric companies and proposes to issue an order in the matter under the Weights and Measures Law of Arizona.

CALIFORNIA.

Pacific Telephone and Telegraph Company. The Railroad Commission made a modification of its order readjusting the long-distance telephone rates of the Pacific Telephone and Telegraph Company. The new rates which provide a reduction in the cost of long-distance service are to go into effect March 21, of this year.

GEORGIA.

Telephone Rates. The Southern Bell Telephone and Telegraph Company announced its intention of increasing telephone rates in the city of Columbus. The city entered a complaint against the proposed increase and an investigation in the matter is now in progress before the Commission. This will be the first exhaustive investigation into the subject of telephone rates to be made by the Georgia Railroad Commission.

ILLINOIS.

Secretary Appointed. Charles Nicholas Hebner of Chicago was appointed secretary of the Public Utilities Commission to succeed William Kilpatrick, resigned. The salary is $5,000 a year. Mr. Hebner had been employed in the office of the chief engineer of the Chicago City Railways Company.

The Fairburg Telephone Company has applied for approval of an increase in rates.

Chicago, Aurora & Elgin Company. Protests were received from patrons of the traction lines against the proposed increase in passenger rates of the Chicago, Aurora & Elgin Company and the commission issued an order sus-

pending the proposed increase pending a hearing in the matter.

INDIANA.

New Franchises. The Public Service Commission informally rendered an opinion to the effect that it did not have authority to pass upon a new franchise granting the right to furnish a utility service in a territory in which no competing utility exists. This opinion was given in answer to a question of the Ft. Wayne & Northern Indiana Traction Company which has just received a franchise from the town of Lagro, Indiana.

The Indiana Fuel and Light Company, operating in Kendallville, Auburn and Garrett, was authorized to execute a new mortgage for $500,000. Of this amount $200,000 is to be used to retire outstanding bonds and $75,000 is to be used for construction and the remainder will not be used until legitimate expenses of the company show a further bond issue to be necessary. The $75,000 of new bonds are not to be sold below 85 per cent of their face value.

KANSAS.

Standard Electric Light Company. The Kansas Public Utilities Commission has issued an order reducing the annual rental of street lamps in Argentine, a section of Kansas City, from $65 to $55. The order followed complaint of officials of Argentine that the Standard Electric Light Company, which is serving the town, has been furnishing arc lamps to another city at the $55 rate. The Commission held that the minimum rate must be made general.

KENTUCKY.

Municipal Regulation. A bill has been introduced in the House and referred to the Committee on Public Utilities which would give municipalities of the second class the right to fix the maximum rates of electric companies, natural or artificial gas companies, street railway companies and water companies, and the right to acquire the property of the public utilities and to operate the same under such rules as may be established by ordinance.

MASSACHUSETTS.

Municipal Acquisition of Public Utilities. A bill is under consideration by the Massachusetts Legislature which provides that, after a city or town votes to establish a municipal plant, the municipality shall purchase an existing plant if the company shall elect to sell the same in the manner afterward described in the bill, unless the Gas and Electric Light Commissioners shall, upon the written petition of the city council, or selectmen, determine that the public interest does not require the purchase. The transfer of property shall include both a gas and electric lighting plant if they exist in combination. The value of the property shall be determined by a special commission, and in case of the necessary severance of a plant, so that the community shall acquire only that part which lies within its limits, the damages resulting shall be included in the purchase price. Enhancement on account of future earning capacity in the public streets shall not enter into the estimate of value.

Leominster Gas Light Company. The Gas and Electric Light Commissioners have approved the issue of 850 shares of new capital stock at $100 per share by the Leominster Gas Light Company, the proceeds to pay notes outstanding December 31, 1913. The company asked approval of an issue of 1250 shares. This request was opposed by the town of Leominster. On the date of the petition the company's indebtedness for plant expenditure was about $115,000. The commission holds that not less than $30,000 of the expenditures represented by notes of December 31, represented the cost of property substituted for other property abandoned, and should not be financed by a stock issue, it being essentially replacement of plant.

NEW YORK.

Resignation of Chairman. Martin S. Decker resigned as chairman of the Public Service Commission of the Second District and was succeeded by Seymour Van Santvoord, who was recently appointed to a place on the commission. Mr. Decker retains membership on the commission.

The Brooklyn Borough Gas Company has voluntarily agreed to write off $428,428 of excess capitalization following the suggestion of the Public Service Commission for the First District. The company proposes to charge off at once $178,428 and to amortize the remaining $250,000 by setting aside each year a special fund equal to five cents for each 1000 cubic feet of gas sold during the year. The Company's capitalization was found to be excessive in a rate case before the commission conducted by Commissioner Maltbie. In his opinion reporting the case to the commission, the commissioner commends the company for its action.

No Rent for Meters. An amendment introduced in the assembly proposes to amend section 66 of the Transportation Corporation Law as follows:

"Sec. 66. No Rent for Meters to be Charged. No **electric light** or gas light corporation in this State shall charge or collect rent **or ready-to-serve charges** on its gas **or electric light** meters * * * and to constitute a part of the contingent or general fund thereof."

New York Telephone Company. The Public Service Commission for the Second District has decided against accepting the offer of the New York Telephone Company to set aside $200,000 of its own funds to defray the cost of a valuation of its property by the state. The commission held that it would be unlawful to accept the company's offer. The commission says: "That it is deemed unwise and improper for this commission to accept or use in its administration any private funds, particularly from a company whose practices and charges are under investigation and determination by the commission." The Legislature is urged to make the necessary appropriation for the proposed valuation.

PENNSYLVANIA.

Standards of Service. The Public Service Commission has under consideration the adoption of rules governing the use of gas, electricity, water and steam meters, the testing of meters, and the standards of service to be furnished.

WISCONSIN.

The Chippewa Valley Railway, Light & Power Company was authorized to issue $42,000 preferred stock for the purpose of buying the electric light plant and business of the Ellsworth Heat, Light and Power Company at Ellsworth, Wisconsin. This plant is in territory adjoining the Chippewa Valley Company's lines. The latter company is a large producer of hydro-electric power and supplies nearly all of the cities in the Chippewa Valley.

Unnecessary Duplification. The commission, on its own motion, made an investigation of the violation on the part of the Lisbon Telephone Company of Chapter 610 of the Laws of 1913, relating to the construction of competing lines by telephone utilities. It apears that the Lisbon Company had built a line paralleling one of the Pewaukee-Sussex Telephone Company's lines, without first obtaining a certificate of convenience and necessity. The commission, finding that the violation of the statute was not willful, conducted an investigation into the reasonableness of the extension as if such extension had not been made and found it a matter of fact that convenience and necessity did not require the building of the line in question. The Lisbon Telephone Company was instructed to discontinue service along the line or be prosecuted.

Telephone and Telegraph Meeting of the American Institute of Electrical Engineers.

The 292nd meeting of the American Institute of Electrical Engineers was held at the Engineering Societies Building, New York City, on the evening of March 13. This was a joint meeting with the Institute of Radio Engineers and was held under the auspices of the Telegraphy and Telephony Committee of the Institute. President C. O. Mailloux called the meeting to order at 8:20 p. m. Cloyd Marshall, of the Telegraphy and Telephony Committee, was called upon to occupy the chair during the early portion of the meeting, and John Stone Stone, vice-president of the Institute of Radio Engineers, presided during the latter half of the meeting.

The first paper to be presented was one by W. Lee Campbell, entitled "Traffic Studies in Automatic Switchboard Telephone Systems."

Traffic Studies in Automatic-Switchboard Telephone Systems.

The paper describes a telephone traffic-recording machine by means of which not only the number of calls for a given period, but also the average duration of each call, is mechanically registered on a moving tape. Observations which were shown, were taken on an automatic telephone system. The graphical record shows the exact duration of each connection, the number of connections made during a given interval, and the number of simultaneous connections in service at each instant. By means of these records it is possible to study the relative efficiency of small and large trunk groups, the average holding time of calls, and these observations permit the switches and trunks to be so arranged that the calls will be evenly distributed among the trunks in each group.

M. H. Clapp then presented a paper entitled "A Comparison of the Telegraph with the Telephone as a Means of Communication in Steam-Railroad Operation."

Telegraph and Telephone for Communication in Steam Railroad Operation.

Brief historical descriptions of the use of the telegraph and the telephone on railroads are given, the first train having been handled by telegraph in 1851 and the first handling of trains by telephone on long stretches of main line track having started as late as 1907. In comparison with the telegraph, the telephone circuits cost more to install and operate, but effect a saving in the operation of the railroad, both directly and indirectly, as it is possible to move trains over the road more rapidly. The advantages and disadvantages in comparing the telegraph with the telephone are summarized as follows: In favor of the telephone: Universality, saving of time, rapidity of transmission, psychological effects, promptness in raising offices, no necessity of specially trained operators, saving in expense of railroad operation, and best operation of circuit in heavy weather. In favor of the telegraph: Flexibility in handling circuits, simplicity in installing, maintaining and operating, circuit best adapted for long distances, effects of distance in transmission, saving in cost of installation and maintenance, and the standard of maintenance. As yet very few railroads are using the telephone as much as they could or should. Because many of the economies with the telephone are more or less intangible, railroad managers are rather cautious in authorizing its wholesale installation. They are usually ready to authorize telephone dispatching circuits, as the savings from them are more easily understood than in other applications. In the author's opinion, the up-to-date railroad of the future will handle its operating divisions entirely by telephone, the telegraph being used only for message work for long distances between the terminals and the general headquarters.

The discussion was opened by William Maver, Jr., who spoke of the development of the telephone for train dispatching and agreed with Mr. Clapp as to the advantages and disadvantages of the two methods. An important advantage of copper over iron wire in railroad work in addition to its electrical properties is that iron becomes valueless by reason of corrosion, while copper has considerable value as junk when it is displaced from service. For distances exceeding 200 miles he preferred the telegraph to the telephone for quick, reliable communication between expert operators. Conversation is more readily understood over the telephone when the subject discussed is a familiar one; otherwise there may be more difficulty in recognizing words. A disadvantage of the telegraph is that men require months or years to become proficient in its use. He pointed out that the telephone operator could cut in at any station as an eavesdropper if he felt so disposed. The telegraph operator normally hears everything that passes over the line and this is sometimes an advantage.

William E. Harkness said that certain classes of railway work can be handled more economically by telegraph and it is not likely that this means will ever be entirely eliminated. He referred to the figures given by Mr. Clapp for the expense of line construction and station equipment. The latter may reach $200 per station on trunk lines under complete telephone operation, but there are few roads of this class. Although telephone line construction costs more than telegraph, the facilities are more than doubled. Not only is the speed of transmission increased but an additional telegraph circuit can be arranged with slight additional equipment, or where there are two parallel telephone circuits, a third or phantom circuit can be secured. The telephone cannot compete with the telegraph for distances exceeding 1,000 miles. Traffic should be studied in any individual case before deciding upon long telephone lines. The success of the telephone for train dispatching depends not so much upon the telephone equipment as the means of selectively calling the individual stations. The more ready response of operators to selective telephone calls has led to the installation of selectors on telegraph lines by steam railroads. The idea that the use of the telephone would put many telegraph operators out of a job has not been realized. A more important element in employing men is a general knowledge of the railroad business rather than their specific knowledge of the telegraph apparatus. It has, however, given the railroads a larger field from which to select their employees.

R. N. Hill pointed out that in comparing costs the facilities of a single telephone circuit composed of two No. 8 copper wires had been compared with those of one iron telegraph wire working duplex or quadruplex. It should be recognized that one pair of telephone wires can supply also a telegraph circuit and that this circuit may be duplexed or quadruplexed. If there are two pairs of wires properly transposed they provide not only a train-dispatching and a message circuit but also a third telephone circuit and a telegraph circuit; in other words four circuits from four wires. It would be more fair consequently to compare the cost of one iron wire with one copper wire. On this basis telephony will show up more favorably in regard to initial cost. He referred to the use of booths at frequent intervals along the right of way and suggested the use of automatic switches to disconnect these from the circuit when not in use.

D. P. Grace said that Mr. Campbell's recording apparatus for trunk lines would be of considerable use in manual exchanges as well as automatic ones. He thought the use of train-dispatching circuits would be extended more rapidly if used in conjunction with automatic telephone systems in railroad terminals. Telephone apparatus should be made more rugged, as the maintenance of instruments usually exceeds in cost the maintenance of underground cables or overhead wires in many systems. Poor transmission has resulted in many places from a lack of knowledge on the part of railroad telegraphers and it would pay to have a thoroughly competent telephone transmission engineer to lay out the circuits and see that they are properly connected. Overhead construction along railroad lines must be improved by the use of steel or concrete poles, or else wires must be in-

stalled in underground conduits. The latter would be less expensive if there was co-operation between the railroads and the telegraph and telephone companies.

John B. Taylor inquired as to the relative disturbances on telegraph and telephone lines from contiguous power circuits.

W. Lee Campbell pointed out that the use of the telephone in railroad service might be very much extended by railroads operating their own telephone plants at terminal headquarters. In that way any official can talk directly to any station along the line. This is not possible where local service is through public telephone companies, as the latter object to having private equipment connected to their systems.

M. L. Clapp in closing the discussion stated that selectors had been used successfully on telegraph circuits but they are not generally in use. He did not approve of automatic switches in booths for disconnecting from the line but preferred permanent connections to a separate circuit. He considered it practical to use the automatic system on railroads, especially in connection with shops or at terminals, but there is a disadvantage in arranging for connection of long-distance lines to automatic lines. Electric power lines affect telephone circuits a great deal more than they do the telegraph circuits.

Emil E. Mayer then presented a paper entitled "The Goldschmidt System of Radio Telegraphy." This was illustrated by lantern slides.

The Goldschmidt System.

After paying tribute to the work of Tesla, Fessenden and Alexanderson in developing radio alternators, Mr. Mayer described the high-power radio alternators of Goldschmidt, particularly the 100-kilowatt alternator. He showed how the machine, starting with a frequency of 10,000, produced in the ordinary way, used the frequency through tuned circuits to produce an alternating field which, acting with the rotation of the rotor, produced a frequency of 20,000, and how this 20,000 frequency, through tuned circuits, combined with the rotation, produced a frequency of 30,000. He explained that this increase of frequency was only limited by copper, iron and insulation losses, while for the best output it was necessary to keep the magnetic leakage between the rotor and stator low; therefore it was found desirable to add not more than four or five times. A machine having 400 poles and revolving three times per minute, producing first 10,000 cycles and adding up to 50,000 cycles, was explained as an example. It has a rotating portion 4 feet in diameter, poles 0.4 inch wide, one conductor per slot, each conductor consisting of a bundle of insulated No. 40 wires, rotor and stator made up of iron sheets 0.002 inch thick, separated by paper 0.0012 inch thick, air-gap 0.03 inch. The rotor weighs 5 tons and has a peripheral speed of about 625 feet per second. The capacity of the windings to the iron of the machine, unless properly proportioned, sometimes served as a shunt path to ground. The exciter circuit takes about 5 kilowatts per 100 kilowatts output by the generator. Since April, 1913, a 100-kilowatt machine has been in use at Neustadt, Germany. This station and the Tuckerton (N. J.) station look more like electrical power plants than like the radio station with which we are familiar. The tower is 825 feet high, supporting a 36-wire double-cone antenna, stretched to 40-foot masts, in a circle of 1,500 feet diameter. The most notable feature of the receiving apparatus is the tone wheel, which makes and breaks the receiving circuit. When the receiving circuit is excited by a frequency of 50,000 and the tone wheel makes and breaks the circuit 50,000 times per second, no sound is heard in the telephone, but when the tone wheel makes and breaks the circuit 49,000 times per second, a note having a sound frequency of 1,000 is heard in the telephone. A similar effect may be obtained by running the tone wheel at a lower speed, say 24,500 breaks, but a smaller volume of sound is produced. This gives a musical note to penetrate static and permits of close tuning. Also, by adjusting the tone wheel to give break in synchronism with the frequency from an interfering station, this station may be cut out.

R. H. Marriott opened the discussion on this paper and pointed out the possibility of radiation in the form of equal-amplitude waves displacing the ordinary method, which uses groups of waves of decreasing amplitude. The tone wheel is a remarkable instrument in that it provides an efficient detector and an interference preventer in one. He pointed out that if the Tuckerton station sends equally well in all directions, its message must cover an area which includes Peru, Alaska and the North Pole. Since the range of a station varies greatly with atmospheric conditions, and this station in order to compete with ocean cables must have a minimum range not less than 4,000 miles, its maximum range must reach half-way around the earth. We may be near to a time when news will be sent from one or two powerful stations to many inexpensive receiving stations scattered all over the world.

E. F. W. Alexanderson compared the Goldschmidt alternator with the high-frequency machine which he had designed. He referred to the parallel operation of such machines and stated that his machine could be synchronized. He inquired whether the same was true of the Goldschmidt alternator. He agreed that it was perfectly feasible to regulate the speed with high accuracy. Regarding the use of the alternator for wireless telephony, he told of experiments with a trigger alternator excited by telephone current and giving 15,000 cycles. This was superseded by a device designated as a constancy-breaker device or amplifier. It is possible to build machines of higher frequency than those described and the development of such machines has given great impetus to radio communication by the continuous-wave system.

Lee De Forest compared the Goldschmidt system with the Poulsen arc for high frequency. The disadvantages of the Goldschmidt machine are high cost, absolute constancy of speed, complication of circuits, and lack of flexibility to change in wave-length. He pointed out that it is very important at times to be able to change the wave-length quickly on account of selective absorption in the atmosphere. Such a change cannot be readily made with the Goldschmidt system, where the key control is limited to one particular wave-length. With the Poulsen arc the disadvantages are the necessity for occasional changes of carbon and the accompanying attention; also the lower efficiency. However, the efficiency has been increased during the last three years from 30 to 60 per cent by American engineers. Among the advantages of the Goldschmidt alternator are the constancy of the connection giving the power supply. The large power has not been equalled by the Poulsen station, only 60 kilowatts having been attained at San Francisco. The Poulsen system has the advantage of ease of key control, simplicity in changing wave-length and the presence of a compensation wave with the sending wave, which adds to the secrecy. He stated that in Washington and in New Jersey messages are now being received daily from Hanover and San Francisco. The power at Hanover is 150 kilowatts and at San Francisco, 60 kilowatts, and signals from San Francisco are stronger than those from Hanover. At night signals are received from Honolulu, 6,000 miles away, with surprising loudness.

M. I. Pupin stated that he had included the principles of the Goldschmidt machine in his lectures at Columbia University seven years ago and that he was the first to solve the problems involved. He stated that he had detected as many as 136 harmonics in a machine of this kind and there are actually an infinite number of frequencies. The amplitude of the different tones depends upon the magnetic leakage and it is hard to keep this down in high-frequency machines on account of the large number of pole pieces and the shortness of the magnetic circuit. High magnetic leakage is one of the defects of the Goldschmidt machine. The introduction of external reactance increases the magnetic leakage and is equivalent to loosening the coupling.

It consequently means a reduction of the available energy, which is another weak point of the machine. His experiments did not agree with the author in regard to the intensities of the lower frequencies and he attempted to demonstrate that a large part of the energy was not radiated from the antenna at all. He had never had much confidence in this type of machine and has designed another type which will be presented in a future Institute paper. He referred to the heterodyne receiver and its use of beats. The tone wheel accomplishes the same purpose and anyone can also accomplish it by proper tuning of the receiver circuit. Since the tuning is never exactly right for resonance, there will be two periods with a slight difference and it is easy to get beats between these. The only thing necessary is to construct the circuit with a small damping constant. In closing, he expressed his admiration for the Goldschmidt machine, which required such persistency and care for the completion of its design and construction.

J. S. Stone said that the paper demonstrated the evolution of radiotelegraphy towards the use of increased wave-lengths and the departure from a highly damped wave train. The author regarded these two features as advantageous, but he considered shorter wave-lengths more advantageous. Thus with an antenna whose fundamental had a wave-length of 1,500 meters, operation was carried on with a wave of 6,000 meters. If the fundamental were used the radiating power of the antenna for a given current would be 16 times as great, and moreover the receiving power of other stations would also be 16 times as great. There are other advantages of shorter waves, but a wave of 1,500 meters requires a frequency of 200,000 cycles and this is beyond the capability of the generator. There is no question of the advantage from the use of continuous or undamped wave trains and these are likely to completely supersede the damped wave train, but this does not mean that high-frequency dynamos will be used to supply the energy, since they are not practicable on shipboard; the enormous gyroscopic effect would tear the machine to pieces if operated on anything but an immovable foundation. Moreover, ship antenna are too small to radiate or receive energy at the frequencies necessary with such generators. It seems as though we might be ultimately forced to use the undamped oscillator first suggested by Elihu Thomson in 1892.

The meeting then adjourned to the Institute rooms on the tenth floor where refreshments were served.

Future Institute Meetings.

The 293rd meeting of the American Institute of Electrical Engineers will be held in Pittsburgh, Pa., April 9 and 10. The meeting will be under the auspices of the Committee on Use of Electricity in Mines, and the following papers will be presented: "Mine Duty Controllers," by H. C. Reed; "Self-Contained Portable Electric Lamps," by S. W. Swoboda; "The Construction and Operation of Mine Substations," by H. Booker; "Motor-Generator Sets versus Synchronous Converters as Applied to Mine Work," by W. M. Hoen; "The Development of the Electric Mine Locomotive," by G. M. Eaton. There will also be a general discussion on rules for electrical installations in mines, and the following rules will be used as a basis of discussion: (*a*) German Rules, (*b*) English Rules, (*c*) Bureau of Standards Rules, (*d*) American Mining Congress Rules, (*e*) Pennsylvania Mining Law, Electrical Section.

The 294th meeting will be held in Washington, D. C., April 24 and 25, 1914. This will be a joint meeting with the American Physical Society, under the auspices of the Electrophysics Committee and of the Washington Section. There will be five papers presented on behalf of the Institute as follows: "A Theory of Corona," by Bergen Davis; "Some Investigations of Lightning Protection for Buildings," by T. M. De Blois; "A Milliampere Current Transformer," by Edward Bennett; "Some Simple Examples of Transmission-Line Surges," by W. S. Franklin; "Solenoids," by C. R. Underhill.

The 295th meeting will be held in the auditorium of the Engineering Societies Building, New York City, on May 19. This will be the regular annual business meeting of the Institute at which the announcement of the election of officers for the ensuing year will be made. Following the business meeting there will be a technical session under the auspices of the Committee on Electricity in Marine Work.

The 296th meeting will be held at Pittsfield, Mass., May 29, under the auspices of the Pittsfield Section. The principal subject of the meeting will be "Relative Advantages of Star and Delta Connections," and all the papers presented will be on this general subject.

Western Union to Share With Employees.

A profit-sharing plan for the employees of the Western Union Telegraph Company was announced recently by officials of the company. Under the plan blocks of the company's stock will be sold to its employees at a price below 63.5, the quotation for the stock on the Exchange. The company intends to sell 10,000 shares at 63 and 2,500 shares at 60.

Electric and Gas Fixtures for a Residence.

The Chicago Section of the Illuminating Engineering Society held a meeting on the evening of March 11, at which residence fixtures formed the subject of discussion. Preceding the two papers on this topic W. A. Durgin gave the third of his series of brief talks on the fundamentals of light and illumination, dealing in this case particularly with radiant energy.

Duplicate plans for a residence to cost $10,000 were given to the authors of each of the papers presented and they were asked to make a selection of lighting fixtures to cost not to exceed three per cent of the total cost of the building. Phil Polacheck, a fixture dealer of Milwaukee, Wis., made a selection of electric fixtures and C. A. Luther, of the Peoples Gas Light & Coke Company, Chicago, made a selection of gas fixtures.

Mr. Polacheck treated the subject from the standpoint of the fixture man. He spoke of the strong hold that electric lighting has in residence illumination and said that in his own business, although he deals also in gas and combination fixtures, fully 95 per cent of the fixtures he sells are electric fixtures. The dealer is too easily tempted to supply merely what is wanted, instead of what is needed. The public in general knows little about illumination and is likely to select an array of fixtures entirely unsuited to yielding the best illuminating results. The conscientious fixture dealer attempts to educate the public along these lines and supplies fixtures which, while coming within the limits of the amount set apart for their cost, serve best to give a satisfactory illumination and also a generally artistic effect. Too often the location of outlets and wiring are done without regard to the fixtures that are suitable for each kind of room. It is nearly always better to first select the scheme of illumination and the kind of fixtures to be used and fit the wiring and outlets to match, instead of making the fixtures fit the wiring, as is too commonly the case.

Drawings of the principal electric fixtures that Mr. Polacheck had selected for the particular house in question were shown. For most of the larger rooms he had chosen indirect fixtures, but for the dining room a semi-indirect fixture. In the bedrooms and bathroom, brackets with opal shades were provided on each side of the mirror. The total cost of the fixtures was estimated to be close to $290. With the lamps chosen it was believed that the maximum energy consumption on the average evening would not exceed two kilowatt-hours.

Mr. Luther opened his paper with

a criticism of the architect's plan submitted to him. This had shown lack of sufficient study in the layout of some of the rooms to accommodate the furniture to the best advantage; the lighting outlets likewise were poorly located in some cases. A selection of gas fixtures using almost exclusively inverted-mantle burners was made; this included a profusion of wall brackets, which were much in evidence in practically every room. Mr. Luther said the dining room was the easiest residence apartment to light properly, while the bedrooms were the hardest rooms in which to get satisfactory results. The fixtures Mr. Luther selected aggregated $282.50 for both floors in the residence, leaving $17.50 of the allowed total for incidentals and extras.

The general discussion of the subject which followed the presentation of the two papers covered critiscisms of the suggested lighting equipment as well as a comparison of the relative advantages of gas and electricity for residence illumination.

Historic Duane Street Station is Passing Out of Existence.

One of New York City's electrical landmarks, which had its origin in the mind of Thomas A. Edison and was developed under his skillful guidance, is about to pass out of existence, into the discard of things which have passed their day of usefulness. The old Edison generating station at Duane, Elm and Pearl Streets, which is within the area of the proposed civic center and is being abandoned largely on that account, is of historical importance in the annals of electricity, for the experiments and developments worked out there have been adopted the world over. Mr. Edison gave to New York the distinction of having the first large electric lighting system in the world, worked out by himself and now bearing his name. The Duane Street station, which was built in 1891, was then held to be a wonderful achievement—a show place which engineers came from everywhere to see. They laughed as they compared it with its predecessor, the Pearl Street station, in which Edison used to sleep all night during the period of its construction. The comparison between the half-million-horsepower Waterside generating station of today and the Duane Street station of that day is just as startling.

When the Duane Street station was in course of construction a water famine was threatening New York and the Company drove several deep wells to insure an uninterrupted supply, thereby discovering that the site was the best spot in the city for obtaining artesian water. The office equipment and other things have been transferred to the new headquarters of the New York Edison Company at Irving Place and Fifteenth Street, and the historic old Duane Street station will soon be only a memory.

Lynn Section Meeting.

On the evening of March 6, Walter C. Fish, manager of the Lynn, Mass., works of the General Electric Company, delivered an address in Burdett Hall before the Lynn Section of the American Institute of Electric Engineers on the topic "Side Lights of Our Work."

Instead of treating of things purely electrical, Mr. Fish took what he termed a couple of little side journeys into things fundamental in political economy and science leading up to the work of the professional man of today who co-ordinates and uses scientific facts. Though the work and worth of the engineer as a professional man is becoming better recognized each year, the speaker stated that he would like to see the electrical engineer stimulated to more and better reading along broad lines. For is it not a strange fact that with all the marvelous progress and development of our age in many directions, yet in the realm of mentality we are probably not superior to the ancients? The speaker here made running comments on the triumphs of the engineering of past eras, and showed that in that line, as in arms under Joshua and Alexander, or in the literature of Homer and Aristotle, the past had its wonders of execution and its matchless men.

Mr. Fish then touched on various economic and political problems that are awaiting solution by present-day thinkers and workers. The high cost of living, emigration, profit-sharing, etc., were referred to as not being as intelligently studied as they should be, the study of social science being specially neglected.

On the subject of electricians, Mr. Fish paid a high tribute to the work of Marconi, who realized a problem, set about its mastery, and achieved almost exactly what he set out to do.

At the conclusion of the address Dr. Elihu Thomson was prevailed upon to elucidate some recent experiments in electrical work, which he did in an effective way.

New Jersey State Telephone Investigation.

The New Jersey Legislature has passed a bill authorizing a legislative investigation of telephone rates throughout the state. A joint committee is to be appointed by the presiding officer of each house, composed of three members of the Senate and Assembly, respectively. This committee is to investigate the question of charges and unjust discrimination, and report its findings to the next legislature. It is empowered to subpoena witnesses to require the production of books, records and any data needed.

But slight opposition was offered against the bill, this being that the subject was one which should be dealt with by the Board of Public Utility Commissioners.

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club of Salt Lake City, Utah, on March 12. In the absence of Chairman C. R. Seigel, who was in San Francisco, Leo Brandenberger presided. W. S. Cozad, president of the Colorado Electric Club, was present as a guest and extended the greetings of his club to the Utah Electric Club. He told how the Colorado Electric Club had grown so rapidly as to make it necessary to absorb the Traffic Club, which had formerly been the principal commercial club of the city. J. F. Greenwald, special representative of the Mountain States Telephone & Telegraph Company, recently transferred to Salt Lake City from Helena, Mont., followed with a few well chosen remarks. John D. Spencer, general agent of the New York Life Insurance Company, who has conducted a regular class in "Salesmanship" at the Y. M. C. A. for the last five years, delivered a talk on this subject as the regular speaker of the day.

At the regular weekly luncheon of the Utah Electric Club at the Commercial Club, Salt Lake City, Thursday, March 5, Miss M. Alisparo and Miss J. Betts, employees of the Mountain States Telephone and Telegraph Company, furnished a most entertaining musical program while luncheon was being served.

The talk of the day was given by Dorsey A. Lyon, acting chief metallurgist of the United States Bureau of Mines, on the subject: "The Electric Furnace, and Its Application in Electrochemistry and Electrometallurgy." He pointed out that the essential requisite for the application of the electric furnace to these processes is the availability of large quantities of cheap electric power. Where this is available, as at Niagara and in certain other places of the United States, electricity may be successfully and economically applied in the preparation of many special substances, as carbide, nitrates and ferro-alloys. There is one plant now operating on a commercial basis near Shasta County, Cal. Otherwise, the application of electricity to the mining industry in the West is confined principally to experimental plants.

POWER PLANT OF THE UNION CENTRAL LIFE BUILDING IN CINCINNATI.

An Exceptionally Fine and Complete Equipment.

The building recently erected by the Union Central Life Insurance Company at the intersection of Fourth and Vine Streets in Cincinnati, O., is the tallest building on the American continent west of New York. It requires but a passing view of the grandly imposing facades of the colossal tower mounting majestically to a height of 535 feet above the basement level, to confirm, in the mind of the observer, the truth of the claim made by the projectors of this monumental edifice, and by those whose enterprise and splendid spirit of civic pride has made possible its materialization, that it embodies the most up-to-date ideas in office-building construction. It presents a striking example of the beautifully impressive style of architecture that had its inception during the Italian Renaissance, and which so admirably adapts itself to the structural requirements of buildings of this character.

In ground area the building is 100 by 150 feet. The main tower extends 34 stories above the level of the street; while the extended structure at the rear rises to a height of eighteen stories. The pyramidal roof of the tower is inclosed by an ornamental balustrade that forms a parapet above the entablatures of four freely standing colonnades, the latter bordering loggias that look to the four points of the compass. The pyramid is crowned by a square pinacle or lantern which has been designed for use as an observaton gallery, whence a view of the surrounding country may be had throughout a range of many miles radius.

Engine-Room Equipment.

The engine-room equipment is completely modern in all respects. The main units consist of two Hamilton-Corliss tandem-compound engines with nonreleasing valve gears and inertia governors. These engines are of the dimensions 18 and 28 by 30 inches; they run at a speed of 150 revolutions per minute, and each is rated at 500 horsepower. Each engine is directly connected to a Triumph compound-wound generator of 300 kilowatts capacity, delivering, when fully loaded, 1,200 amperes of direct current at 240 volts. There is also a simple engine of the dimensions 16 by 30 inches, and of the same make as the large units; this engine is directly connected to a 150-kilowatt generator.

All of the foundations of the apparatus in the engine room are faced with white glazed brick, and each is capped with a four-inch layer of white concrete. The floor is laid with six-inch white flint tiling, and the ceiling is covered with two-inch asbestos block over which has been spread a half-inch veneer of hard asbestos plaster, there being an air space between the asbestos lining and the ceiling proper, and the whole forming a perfect insulator against heat for the floor above.

A three-wire system of electrical

Union Central Life Building Illuminated.

distribution being employed, two balancing sets have been installed to rectify inequalities of current consumption. These machines were supplied by the Triumph Electric Company, Cincinnati, O.

The switchboard panels are of blue Vermont marble. The space in rear of the board is inclosed on top and at the ends with an ornamental iron grill. The board is furnished with a complete equipment of switching apparatus and recording instruments of the most improved type. There are I. T. E. reverse-current circuit-breakers, Keystone ammeters, illuminated voltmeters, Sangamo wattmeters, and flush-front bulls-eye pilot lamps. The main switches are of the single-pole double-throw variety. Double-pole switches are used in the power circuits, and triple-pole switches in the lighting circuits. Two sets of busbars have been installed. With this arrangement one of the main units can be operated for the lighting of the building, while the other supplies the power circuits; or, if occasion so requires, one machine can be made to serve both purposes. The voltage of the power circuits is 240, while that of the lighting circuits is 120.

The Electric Elevators.

Twelve Otis traction elevators, equally divided to form two batteries, are arranged along opposite sides of the main elevator lobby. The cars have wired-glass doors, and run at a speed of 600 feet per minute in shafts that are inclosed in fireproof partitions. The cars are made of bronze, and each has an emergency door that will permit the transfer of passengers to an adjacent car in the event of one of the cars becoming stalled between floors. Six of the elevators travel between the first and eighteenth floors, two run between the sub-basement and the eighteenth floor, and four run to the twenty-eighth floor.

The elevators are equipped with magnet control apparatus, and with automatic safety brake and limit stops. Each car is provided with an emergency switch. All terminal buffers are of the oil-cushion design.

The signal service consists mainly of the Armstrong flash-light system. In addition to this there is a complete telephone system by means of which the starter on the main floor can get into direct communication with the operator of any car at any point in the elevator hatchway. Annunciators have been installed for use after nightfall, the flash system being then cut out. In the main lobby on the first floor there is an elaborate position indicator; this device shows, by means of miniature electric lamps, the position of any car at any time.

Boiler-Room Equipment.

Four Heine water-tube boilers, rated at 250 horsepower each, furnish the steam for the various needs of the building. These boilers are set with Murphy furnaces, and can be operated singly or in battery of two or more, as the case may require. The trimmings and fittings of the boilers are highly ornate, the water-column piping, for example, being of extra heavy polished brass. Each boiler is fitted with two four-inch Consolidated

spring-loaded safety valves, and a Schutte & Koerting automatic stop and check valve.

Coal for use in the boiler furnaces is delivered from the wagons into a bin which has a capacity of 600 tons. Steel cars, having a capacity of one ton each, are used for conveying the coal from the receiving bin to points within convenient reach of the firemen. Each car is run upon a platform scale en-route, and the exact weight of the contained coal is entered upon the regular boiler-room record. The ashes are thrown into special cars, which are run upon the platform of an electric hoist and dumped at the rear of the building.

Two Worthington compound duplex pumps, of the dimensions 8 by 12 by 6 by 10 inches, and of the outside-packed plunger type, and one 6 by 4 by 6-inch, simple duplex pump of the same make, are used for conveying the feed water. These pumps take their suction from the street mains and discharge the water through two Blackburn-Smith filters, whence it passes to an 800-horsepower Reilly multicoil feed-water heater, and thence through a Worthington metering apparatus to the boilers. Supplementary to the regular feeding apparatus, each boiler is equipped with a Metropolitan injector. Extra heavy brass pipe and fittings of the two-inch and four-inch sizes, and extra heavy Hancock valves have been used to form the feed lines. The steam supply pipe of each feed pump is fitted with a Mueller regulator, which will automatically check the flow of the steam to the pump should the discharge, from any cause, be accidentally obstructed.

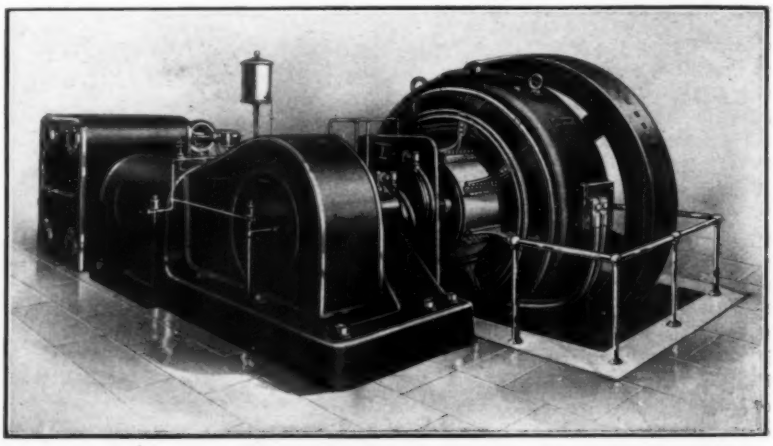
The stack is 535 feet high and is 5.5 feet in diameter, both at the top and bottom; it is made of steel, and it springs from the building at the apex of the tower. The main damper is controlled by an automatic regulator.

All of the masonry in the boiler room is faced with glazed brick which, with the highly polished brass trimmings, and the neatly covered and painted high-pressure piping, imparts to the whole an aspect of trim tidiness. The floor is covered with cast-iron plates in a setting of cement.

The boilers are connected by long radius bends to a twelve-inch main steam header, and to a seven-inch auxiliary steam header for supplying the pumps. All of the valves and fittings used in this system of piping are made of cast steel and the nozzles are electrically welded. The pipe flanges are of rolled steel and have the improved Kellogg type of joint. Open-hearth steel pipe has been used in all steam lines of six-inch diameter, and over, while extra strong wrought-iron pipe, with extra heavy cast-iron screwed flanges has been used in steam lines of less than six-inch diameter. Copper gaskets are used throughout.

All of the high-pressure steam piping, of four-inch diameter and over, is covered with a double standard thickness of 85 per cent magnesia; while the steam piping of less than four-inch diameter is covered with a single thickness of the same material. The magnesia insulation throughout is inclosed in an outer casing of asbestos paper, and a smooth, even surface has been imparted to the whole by sewing on a final covering of eight-ounce ducking, no bands having been used. This work was done by R. E. Kromig & Company, Cincinnati, O.

Steam-flow meters have been inserted in the various lines leading to extraneous points of steam consumption. All of the reducing valves used in the system are of the Atwood & Morrill make. The condensation in the steam lines, as well as in all of the other steam apparatus throughout the building, is drained through Anderson steam traps.



One of the Main Generating Sets, Union Central Life Building.

The Heating System.

The Dunham vacuum system of steam heating is used. The down-feed method is employed between the basement and the seventeenth floor; above this floor the up-feed method is used. The flow of steam and also of hot and cold water in the piping systems above the seventeenth floor is controlled from a pipe gallery which occupies the entire area of the tower at a level midway between the sixteenth and seventeenth floors. A similar arrangement of controlling valves has been installed in the basement for regulating the supplies of the commodities mentioned to the systems of piping below the seventeenth floor.

All of the horizontal runs of piping to the radiators have been carefully insulated and laid in galvanized-iron conduits, which have been imbedded, for concealment, in the cement floors; this device leaves the pipes unhampered in the matter of expansion and contraction. The steam and return risers, with expansion joints suitably placed, are similarly concealed in the columns of the building.

The 14-inch main exhaust riser, which enters the stack at the level of the twenty-third floor, is fitted at its lower extremity with a suitable back-pressure valve for deflecting the exhaust from the engines into the heating system. To forestall any emergency that may arise, a supplementary 14-inch exhaust pipe is connected to the stack at the basement level. A vitrobestos lining, extending 30 feet above the point of entrance of the principal exhaust riser, amply protects the steel plate structure from the moisture passing in with the exhaust steam.

Hot water for the building is secured by means of three Goubert generators equipped with thermostatic controlling devices. One of these generators supplies the building from the first to the seventeenth floor, another from the seventeenth floor to the summit of the tower, while the third is held in reserve. The three generators are cross-connected.

Pumping and Refrigerating Equipment.

Two Fairbanks-Morse compound duplex pumps, of the dimensions 12 by 18 by 7 by 12 inches, elevate the water for house purposes to a 7,000-gallon tank which is mounted at the height of the thirtieth floor, and also to a 12,000-gallon tank set at the eighteenth-floor level. These pumps are fitted with Fisher governors.

A 16 by 8.5 by 12-inch underwriters' fire pump of the Fairbanks-Morse outside-packed plunger type has been installed for protection against fire. To further guard against the danger of local conflagrations that might break

out here and there, 100 fire extinguishers have been distributed throughout the building.

Two 8 by 10 by 12-inch Burnham pumps, equipped with Fisher regulators, are used for discharging the returning condensation from the heating system and for creating and preserving the necessary degree of vacuum therein.

One Clayton automatic steam-driven air compressor, of the dimensions 5 by 5 by 5 inches, and one electrically-driven air compressor, are used for supplying air at the proper tension to a pneumatic ejector, which elevates the accmumlations of waste water in the sub-basement to the level of the discharge into the sewer. There is also an electrically driven Gardner air compressor, for use in connection with the thermostatic valves of the heating system.

The main unit in the refrigerating equipment, of ten tons capacity, which supplies the cold storage and drinking water needs of the occupants of the building, is a Frick compressor, driven by an Eclipse-Corliss engine. This unit is lubricated by means of a gravity oiling system. The cooling effect is produced by means of a brine circulating system. A 6 by 4 by 6-inch duplex pump is used for keeping the cold brine in circulation to the height of the seventeenth floor. Two 6 by 3.5 by 6-inch duplex pumps maintain the circulation in the system of piping which conveys the water to the drinking fountains located upon every floor up to the twenty-ninth. Recording thermometers are attached to the drinking-water system.

Miscellaneous.

Two 14 by 10-inch Blaisdell vacuum cleaning machines, operated by Bullock interpole motors, have been installed. These machines are furnished with automatic controlling devices and each machine is of 10-sweeper capacity.

In the boiler room there have been fitted up three sets of Acme air-washing and purifying apparatus. One of these is for the Chamber of Commerce, another for the basement, and the third for the sub-basement. Besides these machines, there are two exhaust fans, one for the boiler room and the other for the engine room; the former is of 66-inch size, and the latter of 48-inch size.

There are three six-inch fire lines running up through the building, each line having an outlet convenient to each floor. Over 4,000 feet of fire hose, in lengths of 50 and 75 feet, have been placed in racks contiguous to these outlets. The building is also equipped with Gamewell's auxiliary fire-alarm system, 48 alarm boxes being placed at available points. When any box in the system is pulled, an automatic device will cause the number of the particular box to be struck upon a 10-inch gong in the engine room and not this alone, but it will operate to dispel whatever somnolence may prevail in that tranquil region by repeating the ringing of the number four distinct times.

The basement and sub-basement are lined throughout with tarred felt and pitch, and are thus made absolutely waterproof.

This interesting plant is under the supervision of Capt. W. M. McIntyre, who is well and favorably known to the engineers of Cincinnati and the neighboring cities. In direct charge of the power plant, as chief engineer, is C. B. Garrison, who for more than 15 years has been an operating engineer in Cincinnati.

Electric-Vehicle Parade in New Orleans.

Exports of copper for the week ended March 12, totalled 10,870 tons, compared with 18,638 tons for that week last year.

Electric Vehicle Association of New Orleans Organized.

On March 6 there was organized at New Orleans, La., the Electric Vehicle Association of New Orleans. This followed an enthusiastic meeting held at the Hotel De Soto. T. B. Rhodes was elected president and W. E. Clement secretary. The organization includes representatives of the vehicle manufacturers, storage-battery interests, electric garages and central-station company.

The association determined to take a leading part in all civic improvements, such as improved pavement and maintenance of streets, building of good roads and the fostering of any project that will promote the more general use of electric vehicles, both of the pleasure and commercial types.

Leading up to the organization of the association was an electric vehicle parade on February 25 in connection with the Mardi Gras festivities. The illustration herewith shows the parade which was arranged by William E. Clement, head of the commercial department of the New Orleans Railway & Light Company. The parade was headed by a band, directly after which was a bugle corps, then there were 15 work trucks used by the Railway Company in its service department. There were also a number of electric trucks loaned for the occasion by several of the breweries and other commercial interests.

In New Orleans and throughout the South generally great interest is being manifested in the use of electric vehicles, and their quiet and smooth operation, absence of objectionable odors, ease of control and reliability are making many friends for this type of vehicle.

Springfield, Mass., to Investigate Advisability of Municipal Plant.

The city government of Springfield, Mass., proposes to employ an expert electrical engineer to advise the city as to the desirability of installing a plant to supply the municipal buildings known as the municipal group. The city now pays seven cents a kilowatt-hour for energy supplied by the central station. In response to the Board of Supervisors' request for an estimate on the cost of the suggested installation, the Crocker-Wheeler Company and the Power Equipment Company submitted a joint bid of $15,000, and estimated the cost of producing the energy at four cents a kilowatt-hour.

Successful Rejuvenation at Twin Falls, Idaho.

A most successful rejuvenation of the Jovian Order was held at Twin Falls, on Saturday, February 28, under the direction of E. A. Wilcox, Twelfth Mars. Sixteen initiates were taken into the order.

New Electrical and Mechanical Appliances

The Bristo Safety Set-Screws.

The Bristol Company, Waterbury, Conn., has recently put on the market a new improved line of Bristo patented safety set-screws. These are shown in the three accompanying illustrations. They are manufactured under the Goodwin patent of October 14, 1913. The patented design is shown in the cross section, Fig. 1, from which it may be seen that there are six dovetailed slots inside the hollow center of the set-screw, and six corresponding flutes on the outside of the special wrenches used therewith. The dovetailed design is such that when these set-screws are set up hard with the special wrench, the latter gives the screw a true rotary motion without the usual tendency to expand and crack the hollow head. The angles of the surfaces of the slots are such that there is even a tendency for the wrench to contract or compress the head of the screw. From this it will be seen that these screws are particularly well adapted for use where often taken out and in or where set up and loosened repeatedly, as for instance in lathe dogs which are adjusted frequently.

Fig. 1—Section of Bristo Safety Set-Screw.

Fig. 2—Bristo Safety Set-Screw with Cup Point.

Fig. 3—Assortment of Safety Set-Screws with Their Respective Wrenches.

These screws are manufactured in a great variety of sizes, a few of which are shown in Fig. 3. They are made with five styles of point, namely: flat, cup, cone, dog and round points. The wrenches are fluted at both ends so as to permit screws to be put into deep holes or other places where a long wrench is needed. A special treatment process is used which makes the screws glass-hard on the outside and extremely tough on the inside, and samples have been found in actual test to be 100 per cent stronger than the old hex-style set-screws.

The "safety first" movement has progressed so far that great attention is now being given to changing the design of machinery to protect human life, and the elimination of the old-style set-screws with projecting heads is one of the things which safety engineers and insurance inspectors insist on. At the first International Exposition of Safety and Sanitation, which was recently held in New York City, a silver medal was awarded to the Bristol Company in connection with its exhibit of safety set-screws.

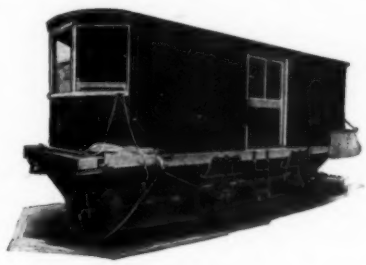
Storage-Battery Cars and Snow Sweepers Give Reliable Service.

The recent snowstorms which occurred in the eastern part of the country were particularly severe in New York City. The large fall of snow accompanied by wind caused drifts which seriously impeded traffic in the metropolis. Transit lines were demoralized and for some time street traffic was almost entirely suspended. In the midst of this chaotic condition of affairs, it is interesting to note the service which was rendered on both the lines of the New York Railways and the Third Avenue Railway Company by storage-battery cars.

When a number of the lines in New York City were crippled, the storage-battery cars of the Third Avenue system kept the Forty-second Street cross-town line in service and on Fifty-ninth Street and Broadway these cars were used with very satisfactory results, both to the operating company and to the public. The storage-battery cars operated by the New York Railways Company were also kept going through the storm of March 1 and 2.

The very heaviest work done in connection with cleaning away the snow was done by the storage-battery snow sweepers. These sweepers were kept in nearly continuous operation.

At a conference of city and railway officials held in New York on March 6 to discuss means of fighting snow, a letter from President F. W. Whitridge, of the Third Avenue Railway Company, was read by Superintendent Maher, in which Mr. Whitridge made this suggestion for cleaning the streets: "Why should not the city have a number of storage-battery sweepers, such as we use, and which work perfectly, to sweep the snow from both sides of the street into the middle. I believe it possible for 15 of these sweepers to keep Fifth Avenue from Washington Square to 110th Street perfectly clean, with a fairway on each side of the snow so banked in the center of the street."



Storage-Battery Snow Sweeper in Service in New York City.

There are at present 207 storage-battery cars used in New York City by the Third Avenue Railway Company and the New York Railways Company,

all of these cars being equipped with lead-plate batteries. Of these cars, 175 are equipped with Hycap-Exide batteries, manufactured by the Electric Storage Battery Company, Philadelphia, Pa., as are also four battery snow sweepers.

Electrically Driven Ice-Cream Freezer and General Power Machine.

A convenient-electric appliance designed for use in residences and small refreshment parlors has been developed by the Dana Manufacturing Company, Cincinnati, O. This machine primarily is a motor-driven ice-cream freezer, which also has attachments for crushing the ice and for various utility purposes; thus it can be used for operating a washing machine, for sharpening knives, hatchets and other edged tools, for cleaning and polishing silverware or for driving an ironer or mangle.

The power consumption of the machine is so small as to permit it to be attached to any lighting circuit. The cost of operation is very moderate. The manufacturer claims that because of its all-around utility it is more serviceable for general household purposes than where separate motor-driven washers, freezers and other machines are used. The machine is mounted on a sturdy iron framework and has a bracket for the freezer and a hopper and chute connected with the ice crusher. An auxiliary shaft provides means for driving a buffer or emery wheel and for connecting the machine to a washer or other appliances.

Motor-Driven Freezer and General Power Machine.

New Outlet-Box Attachments.

There has been a demand for fittings that can be readily secured to the ordinary plain open outlet box or ceiling plate. This has been met by James C. Phelps, of Springfield, Mass., who is manufacturing a number of special covers for such boxes, and a rosette therefor. Fig. 1 shows the latter installed. This rosette is made of fine white glazed porcelain and makes a very handy fitting for the attachment of a drop cord to an open outlet-box cover plastered into the ceiling. Like the special covers and other attachments made in this line, these rosettes are attached to the outlet box by means of two stove bolts, the nuts of which turn in channels that extend into the box. The lower ends of the channels are inclined backward toward the center of the fitting so that the nuts can be held with the thumb and finger as shown in Fig. 2. When inserted into the box and when the screws are tightened up, the nuts move out on the inclined surfaces in the channels and engage the inner edges of the box cover. In this manner the fitting is securely fastened to the box without having to resort to any special ears or screws on the outlet-box cover.

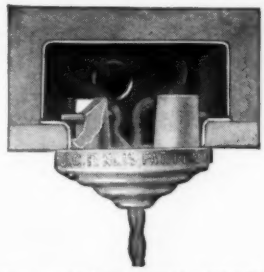


Fig. 1—Phelps Rosette Installed.

Fig. 2—Showing Ease of Installation.

Among the special covers made by Mr. Phelps is the one shown in Fig. 3, which is of galvanized iron and drilled to take a Perkins, Bryant or Arrow-E surface switch or wall socket. Another cover is made of galvanized iron and fitted with a flush receptacle. This can also be furnished without the receptacle, but so drilled as to take in one of several types of sign receptacles. A blank galvanized cover for closing an open outlet-box cover not in use is also made and forms a very convenient fitting.

Fig. 3—Special Cover.

These fittings have been placed on the market by L. E. Frorup & Company, 232 Greenwich Street, New York City, who are the general sales agents for these devices.

Realflex, a New Flexible Armored Conductor.

The development of flexible steel conduit and flexible steel-armored conductors has greatly extended the field of the electrical contractor and wireman by permitting him to install in a durable manner protected circuits in many places where formerly this was impossible. The ordinary flexible steel products of this character, however, introduce some difficulties in installation because their degree of flexibility is not sufficiently high; in some cases also the outer steel armor is liable to breakage when subjected to severe mechanical bending strain.

With the aim of overcoming these difficulties, the Western Conduit Company has placed on the market a new kind of flexible steel-armored conductor, which has appropriately been named Realflex because of its exceptional flexibility. This is made possible by making the armor of nearly round galvanized steel wires. The armor is in two layers which readily bend over each, because of the round contact between them, without greatly changing their relative position. Each layer is composed of two wires. The outer surface of the outer wires and the inner surface of the inner wires are slightly flattened to prevent the thickness of the armor from becoming excessive. A special grade of galvanized-steel wire is used which is made in the company's mills from the ore to the finished product, thus every step in the manufacture is under the company's control.

Realflex Armored Conductor.

Among the advantages claimed for this armor are extreme flexibility, great strength, unbreakability and neatness and evenness of the ends when severed. The cable can be bent into sharp bends and even tied into a knot without breaking the armor or injuring the insulation of the conductors within. Although the armor is as strong as a double layer of steel wire can make it,

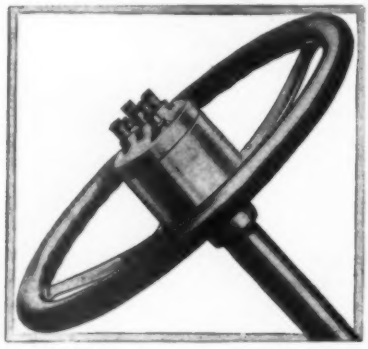
it can readily be removed or stripped from the conductors at the terminals or joints of a circuit. By cutting with a hacksaw nearly through the wires of the armor, each wire can in turn be given a sharp bend or twist and broken off.

The conductors have each an individual tested rubber insulation and upon this a braid covering. This braid is of different color for each wire to facilitate testing out. A second layer of braid surrounds the group of conductors. These armored cables are made with two or three conductors of Nos. 10, 12 and 14 B. & S. gauge wire. Similar cables are made with both lead sheath and steel armor for places where waterproof cable is needed. Standard armored cord and reinforced armored cord is also made with No. 14, 16 and 18 wire. The coils come in lengths of 100 to 250 feet, depending on the size of conductor and type of cable.

The Western Conduit Company is a subsidiary of the Youngstown Sheet & Tube Company. Its main offices are in the Stambaugh Building, Youngstown, O.

Electrically Operated Gear Shift to Replace the Hand Lever on Gasoline Automobiles.

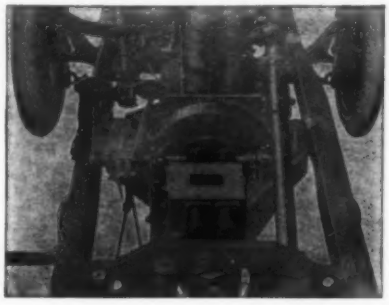
Gasoline automobiles of the immediate future will probably be as easily operated as the electric vehicle, because electricity will be used for lighting, starting and shifting of gears. Mounted on the steering wheel will be a group of buttons, one of which starts the motor, one toots the horn, three are used to shift gears for first, second and high speeds, one for neutral and another for reverse.



Steering Wheel with Control Buttons.

The Vulcan electric gear shift formerly made by the Vulcan Motor Devices Company, of Philadelphia, and now made and marketed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has already been adopted by a number of high-grade cars and other manufacturers are now negotiating with a view to making this device one of the features of their 1915 models.

The accompanying illustrations make clear the principle involved in the electric shifting of gears. Instead of employing a hand-operated lever to shift the gears, power for this work is supplied by a solenoid capable of exercising a 150-pound pull. In the Vulcan system four such solenoids, mounted under the car, control respectively the high, low and intermediate forward speeds and the reverse speed. These solenoids are energized by battery current controlled from push buttons mounted on the hub of the steering wheel, the forward speed buttons being marked *1*, *2* and *3*, (for first, second and third speed) and the reverse speed button bearing the letter *R*. In addition there is a neutral button (*N*) which is used for stopping the car, and two auxiliary buttons (*S* and *H*) which enable the self-starter and electric horn to be operated from the steering wheel.



Electric Gear-Shift Outfit in Chassis.

When one of the speed-changing buttons is depressed the circuit to the proper gear-shifting solenoid is partly closed but the actual closing of the circuit is not completed until the clutch pedal is thrown in, this pedal carrying a small master switch which completes the circuit to the battery. Very little current is used as none is consumed except at the instant the gear-shifting solenoid is energized. Actual tests have shown that the time of engagement of the master switch, and therefore the time that current is flowing from the battery, is less than one-third of a second for each gear shift. With an 80-ampere-hour battery it would be possible to drive a car from New York to San Francisco, shifting gears every quarter of a mile, without exhausting the battery.

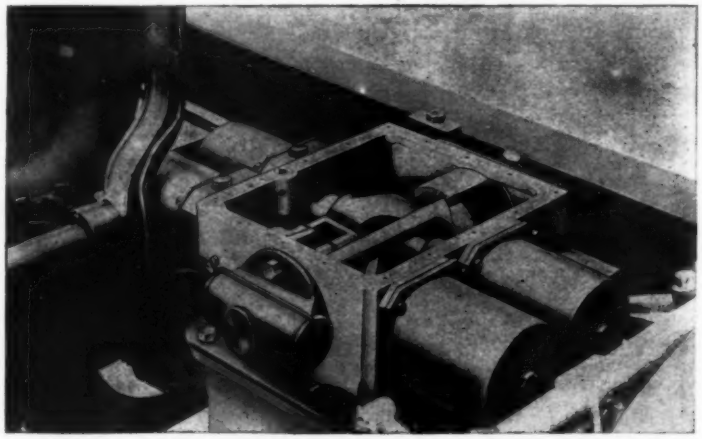
The principal advantages claimed by the manufacturer for the Vulcan electric gear shift are:

1. Ease of operation. There is no stooping over or muscular effort required as with the hand-lever gear shift. Merely push a button and depress the clutch pedal and the solenoids under the car respond with an instantaneous pull of 150 pounds.

2. It can be operated without removing the hand from the steering wheel, or the eye from the road ahead, thus eliminating two frequent causes of accidents.

3. It enables the gears to be shifted with almost incredible speed, a great advantage when worming one's way through the congested traffic of a city's streets.

4. It enables the driver to anticipate speed changes without actually changing the speed until ready to do so. The circuit to the gear-shifting solenoid is completed only when a push button is pressed and the clutch pedal is pushed *all the way down*. Pressing one of the selective push buttons produces no effect. Slipping the clutch produces no effect. But press a button and push the clutch pedal down to the floor board and the gears are shifted instantly.



Near View of Gear-Shift Solenoids and Mechanism.

5. The clutch is always fully disengaged and the gears are always drawn to the neutral position, mechanically, before a shift is made, thus rendering it impossible to strip a gear.

6. The amount of current required to operate the gear shift is very slight, as current is consumed only for a third of a second at the instant the gear-shifting solenoid is energized.

7. The Vulcan electric gear shift provides the one thing needed to make the gasoline vehicle an electrically controlled car. The elimination of the starting crank by the push-button-controlled self-starter was the first step in this direction. The elimination of the hand-lever gear shift by the push-button-controlled gear-shifting solenoid is the logical sequel. With starting, stopping, speed changes and reversing all controlled by push buttons the gasoline car becomes practically as easy to operate as an electric car.

Selector-Type Disconnecting Switches.

The selector type of disconnecting switch is a transfer switch which does not require the circuit to be interrupted while making a change. It can also be used to connect two independent circuits in parallel. However, it is not designed for opening under load and therefore no attempt should be made to open it with current on the line.

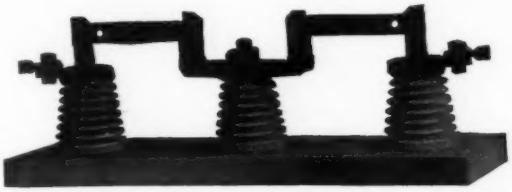


Fig. 1.—Westinghouse Selector-Type Disconnecting Switch for Front Connection, with Both Sides of Switch Closed.

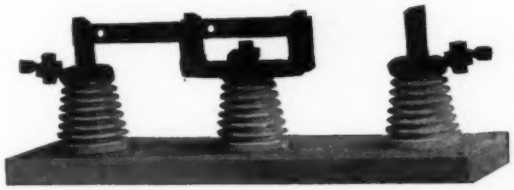


Fig. 2.—Same Switch with One Side Open.

These switches are in effect two single-throw, single-pole disconnecting switches with the hinge jaws connected together and mounted on the same insulator. The hinge jaw is also provided with dummy jaws to hold either blade of the switch in the open position. Except for these differences in the hinge jaws, the construction of these switches is similar to the standard disconnecting switches of the same ratings.

Two types of these switches are made. One type is intended for wall mounting, the live parts being mounted on porcelain insulators carried on a cast-iron yoke or base. This forms a simple, but substantial, construction that is neat in appearance and moderate in price. All parts of this switch, but the porcelain insulators, are finished in black marine.

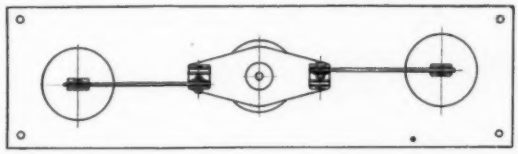
The other type is designed for indoor mounting on marble bases or switchboard panels. It is made for either front or rear connection or for any combination of front and rear connection desired. The copper parts are dipped and lacquered. These selector-type disconnecting switches are extensions of the regular line of disconnecting switches manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Motor-Driven Shade-Roller Measuring, Sawing and Boring Machine.

The motor-driven machine illustrated herewith is designed to saw and bore window-shade rollers and can be instantly set to bracket measure for any style bracket, the machine making all allowances. This eliminates many possibilities of mistakes in cutting rollers and assures perfect fit for the bracket measure taken.

The motor on this equipment operates a saw and drill, the saw operating on the swing-saw principle and the motor hanging below and balancing the saw. When the operator moves the handle on the machine, he automatically turns on the curernt, starts the motor and swings the saw forward. After cutting the end of the roller, a hole is drilled in the center of the roller by pressing it in the cone which surrounds the drill and which automatically centers the roller. The drill is in the center of the cone which is held by a spring that is pushed back while the drill is engaged in boring. Detailed operation of the machine is as follows:

Place rollers in trough *B*, turn lever *C* slightly to the left, which starts the motor *M*; press lever *C* down, which brings saw *D* across rollers, sawing them absolutely square. The sawing operation requires about one second. Place rollers in crotch *E* and insert end in tapered cup *F*, which centers roller of any diameter. Start motor by turning lever *C* slightly to left and roller is bored for pin end perfectly centered. Drive pin, which follows hole bored, thus eliminating all possibilities of wobbling when hung.



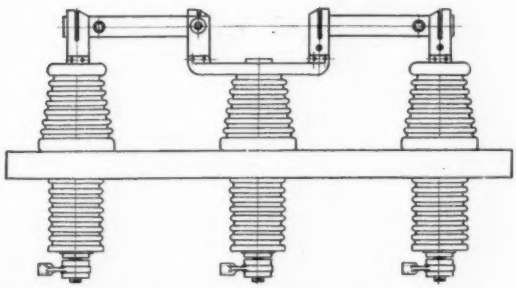
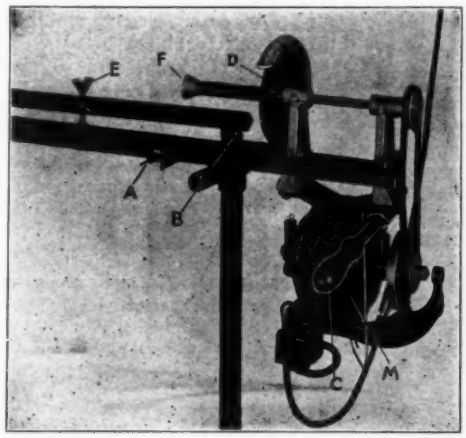


Fig. 3.—Plan and Elevation of Back-Connected Switch.



Shade-Roller Machine.

The motor runs only when cutting or boring and requires hardly enough power to start the meter. One machine in operation for eleven months cut 16,000 rollers at an average cost of 22 cents per month for power.

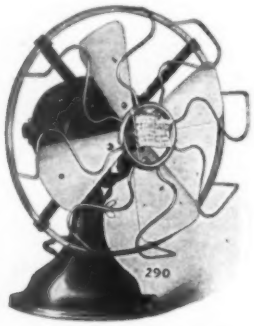
The machine occupies a space of 2 feet by 6 feet, and can be moved at will. The outfit is supplied by Mylod & Sons, Providence, R. I., the motor used being manufactured by the Diehl Manufacturing Company, Elizabeth, N. J.

An automatic telephone exchange is being installed in Simla, India.

New Robbins & Myers Eight-Inch Desk Fan.

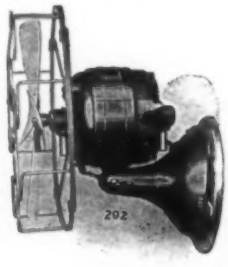
The illustrations herewith show the new eight-inch direct-current desk or bracket fan developed by the Robbins & Myers Company, Springfield, O., for the season 1914. This fan is made for both 110 and 220-volt circuits. By means of a speed-regulating coil and switch in the base, three speeds can be obtained: 1,700, 1,400 and 1,000 revolutions per minute. At these speeds the respective power consumption is 25, 20 and 15 watts.

A hinge joint provides for trunnion adjustment, adapting the fan for either desk or bracket service. The blades are made of the best grade of sheet brass, and are riveted to a punched speet



New Direct-Current Eight-Inch Fan.

carrier which is formed to give a uniform pitch to all blades, the pitch being such as to give maximum air displacement with minimum power. A strong durable guard surrounds the blades; it is fastened to the body by four steel supports which are fastened rigidly by screws. This guard is amply strong to permit the fan to be carried about by it without injury.



Same Fan Used as a Bracket Fan.

The frame and base of the motor are highly finished in baked black enamel with fine gilt stripes. The blades are brushed-brass finish and lacquered. In all details the fan is built strongly; it runs quietly and meets the needs of the home or office where larger fans are not desired.

Bristol Pneumatic Recording Tachometer.

The field of usefulness of recording tachometers is almost unlimited because there is a great need for measuring and controlling the revolutions of shafting, machinery, engines, etc. In some processes in mills it is desirable to have a certain speed or rate of revolutions maintained continuously or certain stops made periodically but not too often and the recording tachometer provides the superintendent or manager with information about the actual operating conditions maintained. For instance, blast-furnace blowing engines are driven at a certain predetermined speed but are usually slowed up once every four hours at casting time.

A pneumatic type of recording tachometer has been developed to be used in connection with blast-furnace blowing engines and for similar applications, such as for recording the speed of paper machines.

In many instances it is not convenient to have a recording tachometer installed in self-contained form and located near the revolving shaft. One of the special features of the new pneumatic recording tachometer is the flexible connecting tube, 25 feet long or longer, between the revolving mechanism and recording instrument which is mounted in any convenient position, as for instance on the wall of the engine room.

The patent on this pneumatic recording tachometer was issued on June 30, 1912, to Prof. Wm. H. Bristol, and these tachometers, as shown complete in Fig. 1, have now been perfected for use under ordinary shop conditions. Some of the first models of this new tachometer have been in successful service for more than 24 years.

The pneumatic principle of operation depends on the centrifugal action of air in a revolving tube which is connected on the recorder through a special oil seal and flexible connection tube.

Fig. 2 shows diagrammatically the construction of the revolving mechanism. In the diagram, *B* designates a hollow circular protecting base and at its upper surface is provided a bearing for a hollow shaft *D*. This shaft is arranged to be rotated from any desired mechanism through a set of gears and pulleys or sprockets.

A pulley *C* is shown over which a belt runs to a similar pulley attached to the shaft whose revolutions are to be measured and recorded. In practice most of these tachometers are being furnished with a special form of sprocket and chain instead of using the pulley and belt shown.

The lower end of the hollow shaft *D* terminates in a horizontal tube *A*, open at its extremities. The upper end of the hollow shaft is surrounded by a casing *E*. It is partly filled with oil and into this extends the free end of another tube *F*. This tube is stationary and is joined at its outer end to a flexible capillary connecting tube *G* leading to the recording instrument.

The recorder used with this patented speed-measuring device is a special low-range Bristol recording vacuum gauge. The recording instrument may be installed

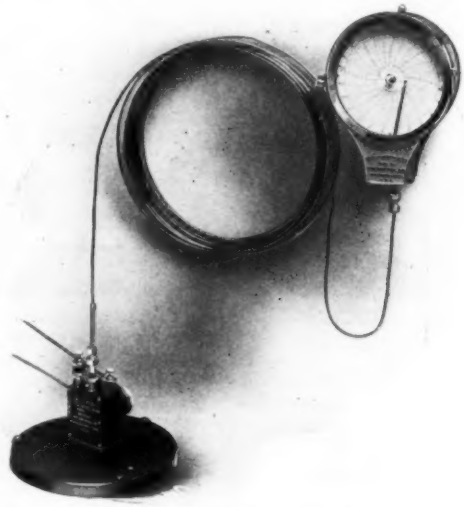


Fig. 1.—Bristol Pneumatic Recording Tachometer.

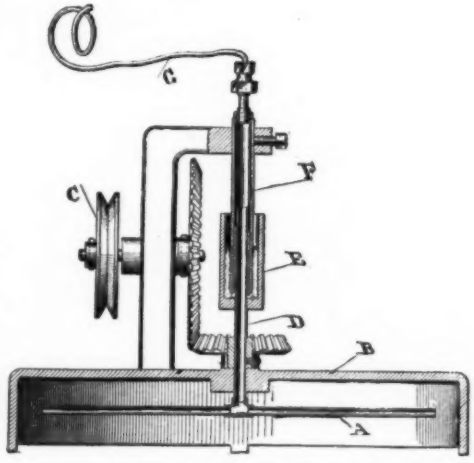


Fig. 2.—Diagram Showing Principle of Operation.

either near to or at a distance from the shaft or engine, the speed of which is to be recorded, and a suitable length of flexible copper tubing is furnished to connect the recorder with the revolving tube.

These patented tachometers are manufactured by the Bristol Company, Waterbury, Conn. This company also manufactures electrical tachometers.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

WILSALL, MONT.——C. S. Hefferlin has received a franchise to establish an electric lighting plant.

WAUBUN, MINN.—A franchise has been granted to Chandonnet & Son to install electric lighting here. C.

CANAL DOVER, O.—The city lighting will be improved. Address Edward Klar for particulars.

MOLALLA, ORE.—M. J. Lee, of Canby, Ore., is preparing to build a $25,000 power house near here this spring.

BRYAN, TEX.—The Bryan Power Company will construct five miles of three-phase 2,300-volt transmission line.

HAVELOCK, IOWA.—S. H. Gill and George Miller are investigating the cost of building a transmission line from Laurens. C.

RICHLAND, MO.—Richland Light & Power Company has been incorporated by W. I. Diffendeffer, B. J. Woodward and L. C. Harris.

MADISON, WIS.—A petition for an ornamental street lighting system was presented to the council by Alderman Frank Alford. C.

CARLYLE, SASK.—$30,000 will be expended improving and extending the electric system. Address Ed. Holmes for information.

SMITH MILL'S, KY.—The municipality is in the market for an engine and dynamo for installation in the city electric light plant. G.

WYMORE, NEB.—The Council is planning ways and means to install an electric system. Address M. L. Rawlings for information.

CLARKSVILLE, TEX. — The Clarksville Light Company will install a street lighting system. Address A D. Simpson, secretary.

CLYNDON, MINN. — A 15-year franchise was granted to the Clyndon Electric Light Company. Oscar Wangen is village recorder. C.

GALT, MO.—Galt Light & Power Company has been incorporated with a capital of $10,000 by A. D. Miller, D. H. Clark and N. D. Jordan.

MILES CITY, MONT.—The city engineer has been instructed to advertise for a new 200-kilowatt generator, cost not to exceed $1,800. O.

RYGATE, MONT.—Local citizens have started a movement for an electric-light plant here. The Village recorder may be addressed.

SYCAMORE, GA.—The J. B. McCrary Company, Third Nat'l Bank, Atlanta, has been granted a franchise to install an electric lighting system here.

ELIZABETH, N. J.—The Hillside Township Committee is planning for the extension of its lighting districts to the Lyons Farms and Saybrook sections. A.

LIVINGSTON, MONT.—The Municipal Ownership League has taken up the question of ornamental lighting. Address Joseph Brooks, president.

DOUGLAS, WYO.—The Douglas Electric Light Company will shortly install an entirely new equipment of machinery at a cost of more than $30,000.

FLANDREAU, S. D.—The Flandreau Light & Power Company, A. H. Savage, St. Paul, treasurer, will build a nine-mile, 13,200-volt transmission line. C.

WINNEBAGO CITY, MINN.—The Commercial Club is planning to install ornamental lighting on the business streets. Address the secretary of the club.

PULASKI, TENN.—The municipality is preparing to spend $20,000 in the completion of its electric light plant, work on which was started some time ago. G.

COLUMBIA, TENN.—John H. Carpenter of Nashville has been granted a franchise to construct and operate an electric-light, power and heating plant.

LOUISVILLE, KY.—John Rohrman, Second and Green streets, plans to manufacture ice machines, and will establish a plant. Motors will be required. G.

ALPINE, TEX.—The Alpine power plant has been sold to George Miller, of Marathon, for $10,000. The new owner will make a number of improvements, it is stated. D.

PITTSBURG, TEX.—The People's Light & Ice Company is being organized here and will erect a light plant and ice factory. Local capital is backing the company. D.

LIVINGSTON, MONT.—The Municipal Ownership League, of which Joseph Brooks is president, has taken up the question of ornamental street lighting. C.

DRESDEN, TENN.—Philip A. Porter, Clinton, Ky., has been put in charge of the construction of an electric light plant for the city at a cost of $27,000. G.

ELLENDALE, N. D.—J. L. Tucker has been granted a 30-year franchise to construct electric light plant. Address John King, city auditor, for desired information.

MORRISTOWN, TENN. — The Mims-Goodson Company will need an electric elevator for a six-story mercantile building, which is now being constructed. G.

HARDIN, KY.—The Hardin Light & Power Company is preparing to install a street-lighting system. Forty arc lights will be erected in the immediate future. G.

PASADENA, CAL.—The City Commissioners have passed an ordinance covering the installation of ornamental lighting on Madaline Drive and on Colorado Street.

ABBEVILLE, LA.—March 26 bids will be received for the machinery for the proposed water and light plant. Address Adolph Brasseux, mayor, in regard thereto.

MELSTONE, MONT.—The City Council recently granted a franchise to O. H. Bennett of Spokane, Wash., for constructing an electric light and power plant in this city. O.

CANBY, ORE.—M. J. Lee, of this city, will build a 20,000 power plant near Molalla, work to begin within the month. It is understood the plant will be in operation within 90 days. O.

ELLENDALE, N. D.—A 30-year electric light franchise has been granted to J. L. Tucker. Work will begin on the plant within 90 days. John King is City Auditor. C.

NEW CASTLE, KY.—The Kentucky Utilities Company, with headquarters at Lexington, Ky., is planning to extend its lighting service from Eminence to New Castle. G.

BRUNSWICK, GA.—The stockholders of the Mutual Light & Water Company are considering the proposed establishment of a new electric light plant by that organization.

BOSTON, MASS.—Architects Shepley, Rutton and Coolidge have prepared plans for Dormitories for Summer College. The specifications include an electric-light plant.

TEMPLE, TEX.—The City Council will soon receive bids for the erection of an electrical pumping unit at the river station of the city water works plant, costing about $4,000. D.

WAYNESBORO, MISS .— The Waynesboro Electrical Company, has been organized with C. C. Green, president. $6,000 will be expended constructing an electric-light plant.

COLUMBIA, TENN.—An electric power plant will be constructed here by John H. Carpenter, of Nashville, who was recently awarded a franchise to furnish light and power to the town. G.

ROSENDALE, WIS. — Wisconsin Light, Power & Milling Company will spend $10,000 building and equipping a hydroelectric plant and erecting transmission lines in this vicinity. C.

GOLCONDA, NEV.—J. A. Fayant has been granted permission by the county commissioners to maintain a power plant and erect a pole and wire system in this town for the transmission of electricity.

ROSENDALE, WIS.—The Wisconsin Light, Power & Milling Company, will spend $10,000 building and equipping a hydroelectric plant and erecting a transmission system in this vicinity.

JUNEAU, WIS. — This city has voted a bond issue to finance an elec-

tric light transmission and distributing system. Current will be purchased of the Horicon Light & Power Company.

LOUISVILLE, KY.—The Louisville & Nashville Railroad Company will need motors for equipment to be installed in a new car repair shop, for the construction of which bids are now being taken. G.

LOUISVILLE, KY.—The Kentucky Public Elevator Company will need motors for the operation of grain-cleaning machinery which it is reported will be bought. Frank C. Dickson is vice-president. G.

ST. PETERSBURG, FLA.—J. B. McCrary & Company, of Atlanta, have prepared plans for a $48,000 electric plant. As soon as bonds are sold contracts will be let for construction. Address the city clerk.

BELLINGHAM, WASH. — The question of bonding the city for the sum of $400,000 for the construction of a municipal electric-light plant is being considered. Address the city clerk for further information.

PERTH AMBOY, N. J.—The Board of Water Commissioners is planning for the installation of a high-pressure salt-water system, to include an electrically operated pumping station. Thomas Grieve is Water Superintendent. A.

LEXINGTON, KY.—The Federal Parquetry Manufacturing Company, New York, is planning the operation of a hardwood flooring plant, motor-driven machinery having been specified. I. Herz is to manage the plant. G.

HOPKINSVILLE, KY.—The Kentucky Public Service Company is preparing to purchase a new franchise, which will enable it to extend its lines to a number of points in the county. The local plant may be enlarged. G.

SABULA, IOWA.—Plans are being considered by J. A. Bradley of this town for erection of transmission lines into the country to furnish power and lights to the rural districts. Power is to be furnished by the local plant. C.

MERCHANTVILLE, N. J.—The Borough Council is considering a plan for the purchase of electric power from the Public Service Electric Company and the installation of a municipal substation and distributing lines for local service. A.

LEWISTOWN, MONT.—Plans for the installation of a cluster lighting system in the business district are being prepared at this time by the city engineer and it is understood bids for materials and installations will be received in the immediate future. O.

WILLIAMS, IOWA.—The Williams Electric Light & Power Company is making arrangements for running a transmission line to Blairsburg and for furnishing that progressive little city with electric lighting. F. R. Payne is manager.

GOSHEN, IND.—The Hawks Electric Company, and the citizens of Goshen, Ind., have petitioned the public service commission to permit the company to extend its electric lines to Waterford and New Paris at a cost of $4,000.

CLEVELAND, O.—City officials and architects have decided to build the power plants for the new City Hospital buildings before other improvements and extensions are made. It is planned to have the powerhouse in operation by October 1. R.

COLUMBUS, O.—Charles Pryor, of the city engineer's office, and John W. Alvord, consulting engineer, are investigating the practicability of utilizing the water at the storage dam for power to be used in operating the various municipal plants of the city.

KLAMATH FALLS, ORE.—Articles of incorporation have been filed for the Keno Power Company, with a capital stock of $250,000, by J. W. Kerns, B. E. Kerns and G. G. Kerns, former residents of Chico, Cal. The brothers propose to enter the local field.

LOUISVILLE, KY.—B. M. Henry, manager of the Louisville plant of the American Oak Leather Company, will shortly let contracts for the equipment required in the electrification of the plant, plans for which have been made by Ward Baldwin, of Cincinnati. G.

SPRINGFIELD, O.—The Industrial Bureau of this city has appointed a committee to investigate the project of erecting a modern power building, to meet the collective needs of small manufacturing plants, to which power and light will be supplied. J.

BURNEY FALLS, CAL.—The State Railroad Commission has authorized the sale of $65,000 preferred stock of the Pit River Power Company to be sold at not less than 80 per cent of the par value, the funds to be applied to the development of the company's hydroelectric system.

ATCHISON, KANS.—An ordinance has been passed authorizing the mayor to enter into contract with the Thayer Foundry Company for the construction and installation of a special lighting system on Commercial Street, between the east line and Fifth Avenue. Address C. C. Finney, mayor.

FT. GAINES, GA.—The Credille Fowler Power & Manufacturing Company, has been incorporated with a capital stock of $12,000 to establish a plant to generate electricity to be used for power in manufacturing plants and for lighting. W. T. Credille, M. L. Fowler, are named among the incorporators.

HOMEDALE, IDAHO.—The Homedale Water, Light & Power Company recently petitioned the Public Utilities Commission for a certificate of public convenience and necessity which will enable the company to furnish the city of Homedale with light and power, etc. The company is incorporated for $50,000, and contemplates the building of a light and power plant as soon as the franchise is granted. O.

BRANDON, MAN.—The first steps toward an inter-municipal hydroelectric power system have been taken upon a comprehensive scale, consisting of Winnipeg, Brandon, Portage la Prairie, and Carberry men, by the appointment of representatives of the Manitoba Grain Growers' Association to go into the entire matter and collect data as to cost, etc., the same to be subsequently submitted to the municipalities interested.

EL CENTRO, CAL. — Work will soon be started on the high-voltage line by which power of the Sierra Power company will be transmitted, under contract with the Holton Power Company, to the Imperial Valley. The company has secured permission to cross all county roads with the lines, which will be run along private rights of way. Work on this line will be rushed. C. E. Paris is superintendent of the Holton Power company. T.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SPOONER, MINN.—The Border Telephone Company will begin work on a line to Loman. C.

HAZEN, N. D.—The Independent Telephone Company has purchased right of way through here for a long-distance line. C.

ELMDALE, KANS.—The Farmers' Mutual Telephone Company has filed articles of incorporation, capitalized at $3,000. M.

ROXBURG, KANS.—With a capitalization of $2,625 the Maple Grove-Olive Springs Telephone Company has been formed here. M.

WESTBORO, WIS. — Westboro Telephone Company has been incorporated with a capital of $2,500 by J. W. Kaye and others. C.

PLANT CITY, FLA.—Hartline and Sons have been granted a franchise to construct and operate for 30 years a telephone system here.

WEBSTER, WIS.—A. J. Cairns, John McArthur and George E. Miller have formed a company to build a telephone line between Webster and Gaslyn. C.

LUVERNE, MINN.—Northwestern Telephone Exchange Company has been granted a new franchise on the condition that the local system be rebuilt. C.

LARCHWOOD, IOWA. — Logan Township Telephone Company has been incorporated with a capital of $1,000 by John McCarty, William Bunte and others. C.

AKELEY, MINN.—The Akeley Telephone Company will make extensive improvements on the local exchange as soon as weather permits, which will include new cables. C.

HENNING, MINN.—Henning-Almora Telephone Company has been incorporated by J. M. Hursh, W. J. Henderson, George F. Johnson and others. The capital is $25,000. C.

OKLAHOMA CITY, OKLA.—South Suburban Telephone Company has been incorporated with a capital stock of $300 by I. N. Needham, H. G. Little and I. C. Dambold, all of this city. P.

INDIANAPOLIS, IND.—The Citizens' Telephone Company has been incorporated with a capital of $8,000. The directors are David Bales, George W. Fry, Milton H. Fry and others.

OKLAHOMA CITY, OKLA.—Trout Telephone Company has been granted articles of incorporation, capitalized at $400. The incorporators are J. C. Farmer, A. Nebers and J. V. Crass, all of Roff. P.

KANSAS CITY, MO.—The Home Telephone Company will spend $200,000 in Kansas City for improvements and extensions, according to an announcement by Theodore Gary, president of the company. A. F. Adams is the new head of the company in Kansas City. M.

NEWPORT BEACH, CAL.—At a request of interested parties the trustees of this city have advertised for sale a 50-year telephone franchise, the bids for which will be opened on the evening of April 20, when a franchise will be sold. By the terms of this franchise the company securing it will be compelled to furnish ten telephones free to the city and also to pay to the city two per cent of its gross earnings. T.

ELECTRIC RAILWAYS.

(Special Correspondence.)

FT. WAYNE, IND.—The Ft. Wayne & Lake Everett Railway Company, has been incorporated with a capital stock of $300,000.

NOWATA, OKLA.—Mayor Schwabe has been authorized to call a special election to vote on a franchise for the proposed interurban line between this city and Coffeyville. M.

MUSCATINE, IOWA.—Plans are being considered by Muscatine, North & South Railway Company for equipping its railway from here to Burlington for electrical operation. C.

NEW ALBANY, IND.—The New Albany & French Lick Valley Railway Company is prepared to let contracts for the construction of its 60-mile interurban line, it is reported. G.

HOT SPRINGS, ARK.—Commercial organizations of Hot Springs and Little Rock will assist in the sale of $200,000 worth of stock to finance the proposed electric road to be built between the two cities. M.

WASHINGTON, D. C.—The Capital Traction Company is authorized by the Public Utilities Commission to sell $360,500 of bonds for extensions, improvements, etc. Address D. S. Carll, secretary.

JONESBORO, ARK.—There is an agitation for an interurban line to connect this city and Paragould. The project is not a new one, but J. R. Brown is here promoting the venture, and it apparently meets with favor on all sides.

COLUMBIA, S. C.—The Columbia-Camden Railroad has been chartered with a capital of $250,000 and work was commenced on the electric line of railway between here and Camden. B. L. Abney and Senator Westeon and others are behind the movement.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company announces that the interurban line will be extended from Centerville to Farmington, a distance of five miles, during the coming year, and that ultimately the line will be continued through to Ogden. W.

FRANKLIN, TENN.—G. D. Howard & Company are engineers for the construction of the Shelbyville, Petersburg and Decatur Railway Company, and are preparing to let contracts. S. P. Kirkpatrick, Shelbyville, Tenn., is president and general manager. G.

ANDREWS, N. C.—The Hiawassee Railway Company has been incorporated to construct an electric railway from Andrews to Haynesville and Hiawassee, Ga., about 35 miles. J. W. Walker, of Andrews, and G. H. Haigler of Haynesville, are the incorporators.

MANHATTAN CITY, KANS.—The Manhattan City & Interurban Railway Company will shortly begin work on the completion of the electric road between this city and Fort Riley, Kan. A part of the road was built last year. Joseph T. West, Manhattan, is general manager of the company. M.

SAN BERNARDINO, CAL.—Announcement has been made that an electric railroad will soon be started from the south to the rim of Death Valley, this to be constructed by the Tonopah & Tidewater Railway Company. A branch will be built from Death Valley Junction to a point on the edge of the valley, 21 miles distant. It will tap the new borax deposits and the Saulsbury gold mines.

NEW INCORPORATIONS.

DETROIT, MICH.—Six-in-One Electric Battery Company has been incorporated, capitalized at $20,000.

DETROIT, MICH.—Victor Electric Supply Company has been incorporated with a capital stock of $15,000 by J. W. McNair, J. N. Burns and others.

COLUMBUS, WIS.—Hale Electric Company has been incorporated with a capitalization of $300,000 by J. T. Hale, W. M. Hale and H. S. Hale.

CLEVELAND, O.—The Federal Electric Company has been incorporated with a capital stock of $1,250. The incorporators are J. S. Kohn, L. M. Young and T. J. Wolf.

HARRISBURG, PA.—Braddock Electric Machine Company has been incorporated with a capital stock of $5,000 by W. J. Nowotny, of Braddock; and P. D. Remington, of Edgewood.

STEUBENVILLE, O.—The Swan Bower Company has been incorporated with a capital stock of $20,000 by George Swan, Matthew Swan, Sam Stark, E. D. Bower and James McCoy.

AMERY, WIS.—Apple River Milling Company has been organized to develop electricity and sell same. Those interested are E. J. Schneider, E. M. Fay and others. The capital is $40,000.

EUGENE, ORE.—The Eugene Electric Cone Manufacturing Company recently filed articles of incorporation with a capitalization of $20,000. The incorporators are Frederick H. Miller, Ernest House, and others, of this city. O.

SYRACUSE, N. Y.—Rogers & Hilton, Incorporated, has filed articles of incorporation as electrical contractors. The capital stock is $25,000 and the incorporators are Frederick Rogers, James S. Hilton and Thomas H. Hilton, Syracuse.

HURLEYVILLE, N. Y.—Mongaup Light, Heat & Power Company, Incorporated, has been granted articles of incorporation, capitalized at $9,000. The incorporators are Ellsworth Baker, Pearl Baker and Frank W. Laid law, all of this place.

MANHATTAN, N. Y.—The Stanley Utilities Company has been incorporated with a capital stock of $10,000 to deal in mechanical electrical and chemical appliances. The incorporators are Charles H. Stanley, Cynthia Stanley and Frank Hauser, New York City.

ROCHESTER, N. Y.—E. C. Sykes & Company, Incorporated, has filed articles of incorporation, capitalized at $25,000, to engage in electrical work, supplies, etc. The incorporators are Edwin C. Sykes, Earl D. Wilcox and Baran P. Sykes, all of this city.

LOUISVILLE, KY.—The Safety Door Securer & Manufacturing Company, organized with $20,000 capital stock, will need motors for the operation of metal-working machinery. Harry Catlett, manager of the Louisville Gas & Electric Company, may be addressed. G.

WORCESTER, MASS.—The E. W. Ham Electric Company has been incorporated with a capital stock of $99,000 to carry on the business of electrical contractors and wholesale dealers in electrical devices. The officers of the company are: President, J. Brinton Bailey; treasurer, Edwin W. Ham; clerk, Paul Fielden; directors, Messrs. Bailey, Ham and H. H. Ham.

NEW PUBLICATIONS.

MINERAL RESOURCES.—The United States Geological Survey has published Part I of "Mineral Resources of the United States" for the year 1912. This deals with metals and covers both industrial and precious metals. Values are given for production, imports, exports and prices.

CAROLINA COMPANY.—The Carolina Power & Light Company, which controls the Yadkin River Power Company and the Asheville Power & Light Company, has issued an illustrated pamphlet to the stockholders of the company describing the physical property and financial condition of the three companies. The president of the company is Charles E. Jackson, Raleigh, N. C.

CANADIAN MINERALS.—The Canadian Department of Mines has issued a preliminary report on mineral production of Canada during the year 1913, prepared by John McLeish. Figures are given for the production of the principal metals, as well as coal, petroleum and various other nonmetals. Statistics of exports are also given. The complete report for the year 1912 is now available. It is a volume of 339 pages, giving complete statistics for all classes of mineral products.

PROPOSALS.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 15 for the lighting fixtures of a two-story building for the post office at Tarboro, N. C.; and until April 21 for the lighting fixtures for the post office at Camden, S. C. Drawings and specifications may be obtained from the custodians of the sites or the office of the Supervising Architect.

ARMORED CABLE, SWITCH PANEL, ETC.—Sealed proposals will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until March 28 for furnishing under Canal Circular 834 lighting fixtures, switch panel and feeder boxes, cable hangers and armored cable for wiring within the batteries, Panama Canal fortifications. Blanks and general information may be obtained from any of the assistant purchasing officers, who are located in all of the large cities.

ELECTRIC WORK.—Sealed proposals will be received at the office of the Pennsylvania Panama-Pacific Exposition Commission, Executive Chamber, the Capitol, Harrisburg, Pa., until March 25 for the construction, plumbing and electric work of the Pennsylvania State Pavilion at the Panama-Pacific International Exposition to be held in San Francisco in 1915. Proposals to be addressed to Hon. John K. Tener, President of the Commission, in sealed envelopes marked "Proposal for Pennsylvania Pavillion" and deposited with the Secretary of the Executive Committee. Proposal shall be accompanied by a bond from an approved trust or surety company in the full amount of the bid conditioned upon the signing and faithful performance of the contract. Plans and specifications may be seen at the office of H. Hornbostel, architect, 1303 Peoples Bank Building, Pittsburgh, Pa.; the office of the commission, 1150 Real Estate Trust Bldg., Philadelphia, Pa., or the office of the Division of Works of the Exposition, San Francisco, Cal. Drawings and specifications may be obtained at the office of the architect at above address upon depositing $25.

FINANCIAL NOTES.

The Illinois Traction Company has listed 150,000 shares of common stock on the Montreal Stock Exchange.

Stockholders of the El Paso Electric Company at a special meeting voted to increase the common stock from $2,000,000 to $3,000,000.

The Rochester Telephone Company, in order to provide a fund of $200,000 for capital requirements, has asked its bondholders to fund two years' interest on their five per cent bonds.

The stockholders of the Northwestern Electric Company, of Portland, Ore., will vote April 8 on a proposition to increase the capital stock to $12,000,000, of which $2,000,000 shall be preferred.

The Cities Service Company has made the payment of $15 a share on the common stock of the St. Joseph Railway, Light, Heat & Power Company, due March 1, together with the interest on the unpaid amount of the purchase price.

The Des Moines & Central Iowa Electric Railway Company, a subsidiary of the Illinois Traction Company, has sold $1,150,000 of its six-per-cent sinking-fund bonds. Bonds are guaranteed, principal and interest, by Illinois Traction Company.

Authorization of a $162,000 five-per-cent bond issue has been granted the St. Joseph Railway, Light, Heat & Power Company by the Missouri Public Service Commission. The company proposes to use the proceeds for extensions and improvements.

At the annual meeting of the Electric Properties Corporation, held at Richmond, Va., Paul D. Cravath, Ernest B. Flippen, J. H. Grassman, Alvin W. Krech, J. R. McGinley and Albert H. Wiggin were elected directors, to serve until 1917. At the organization meeting the board of directors elected A. L. Kramer president, and John Seager secretary and treasurer.

Stockholders of the United States Light & Heating Company will hold a special meeting at Portland, Me., on April 9, to pass on an issue of $1,500,000 six-per-cent bonds for refunding outstanding indebtedness of the company and to provide additional working capital.

At a meeting of the Union Gas & Electric Company, of Cincinnati, a subsidiary of the Columbia Gas & Electric Company, the board was reorganized by the election of A. B. Beach as president; P. G. Gossler as vice-president, chairman of the board; W. W. Freeman, J. C. Ernst and W. Y. Cartwright, as vice-presidents; and T. F. Wickham as secretary-treasurer.

In accordance with action taken by the board of directors and stockholders of the Cincinnati, Dayton & Toledo Traction Company, the capital stock of the company has been reduced from $5,250,000 to $2,250,000. Under the former Ohio law companies were restricted from issuing bonds in excess of their capital stock, but this limitation has now been removed.

The Indiana Public Service Commission has authorized the Richmond (Ind.) Light, Heat & Power Company to issue $850,000 first-mortgage bonds to be sold at not less than 90. The proceeds are to be used to retire the $200,000 first-mortgage refunding five-per-cent bonds which matured on January 1, 1914, and the $500,000 three-year six-per-cent debenture notes due March 1, and to pay for extensions and improvements.

The capital stock of the United Gas & Electric Corporation, which controls the American Cities Company, has been increased from $45,000,000 to $57,000,000. New Orleans financiers were advised that the certificates of increase have been filed in Connecticut. The increase was brought about by the recent absorption of about 90 per cent of the common stock of the American Cities Company, which controls the local railroads in New Orleans, Birmingham, Knoxville, Memphis, Nashville, Houston and other points.

In view of the maturity of the $2,000,000 first-mortgage five-per-cent bonds of the Central Electric Railway Company on May 1, 1914, and the fact that large issues of bonds and notes of the Kansas City Railway & Light Company and the Metropolitan Street Railway Company, of Kansas City, the controlling corporations, have matured and are past due, John B. Dennis, James J. Storrow, Paul M. Warburg and W. K. Whigam have been appointed a protective committee for the Central Electric bonds.

Harris, Forbes & Company and N. W. Halsey & Company, of New York, have purchased from the Pacific Gas & Electric Company an issue of one-year five-per-cent notes, subject to approval by the California State Railroad Commission. The notes will be secured by $5,000,000 general lien 6s and $3,572,000 general and refunding 5s of the company, the same collateral that now secures the $5,000,000 of six-per-cent notes that are to be retired on March 25. This issue will probably amount to $7,000,000, and the proceeds over the amount required to retire the six-per-cent notes will be used for capital expenditures.

Dividends.

American Power & Light Company; quarterly of 1.5 per cent on the preferred, payable April 1 to stock of record March 24.

Arkansas Valley Railway, Light & Power Company; quarterly of 1.75 per cent on the preferred, payable March 16.

Asheville Power & Light Company, quarterly of 1.75 per cent on the preferred, payable April 1 to stock of record March 23.

Augusta-Aiken Railway & Electric Corporation; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable March 31 to stock of record March 15.

Bangor Railway & Electric Company; quarterly of 1.75 per cent on the preferred, payable April 1 to stock of record March 20.

Bell Telephone Company of Canada; the regular quarterly dividend of 2 per cent, payable April 15, to stock of record March 25.

Cincinnati Gas & Electric Company; quarterly of 1.25 per cent, payable April 1.

Cincinnati Street Railway Company; quarterly of 1.5 per cent, payable April 1.

Columbus Railway, Power & Light Company; quarterly of 1.5 per cent on series "A" preferred, payable April 1 to stock of record March 16.

Consumers' Power Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable April 1 to stock of record March 20.

Fonda, Johnstown & Gloversville Railroad Company; a quarterly preferred dividend of 1.5 per cent, payable March 16.

Halifax Electric Railway Company; the regular quarterly two-per-cent dividend, payable April 1.

Illinois Traction Company; quarterly of 1.5 per cent on the preferred, payable April 1 to stock of record March 14.

Lake Shore Electric Railway; quarterly of 1.5 per cent on the first-preferred, payable April 1 to stock of record March 21.

Michigan Light Company; quarterly of 1.5 per cent on the preferred, payable April 1 to stock of record March 23.

New Orleans Railway & Light Company; the regular quarterly dividends of 0.5 per cent on the common and 1.25 per cent on the preferred stock, payable March 31.

New York State Railways Company; the regular quarterly dividends of 1.25 per cent on the preferred stock, and 1.5 per cent on the common stock, both payable April 1, to stock of record March 24.

Otis Elevator Company; quarterly of 1.25 per cent on the common and 1.5 per cent on the preferred, both payable April 15 to stock of record March 31.

Ottawa Light, Heat & Power Company; quarterly of two per cent, payable April 1 to stock of record March 20.

Philadelphia Traction Company; a semi-annual dividend of $2 per share, payable April 1.

Southern Utilities Company; quarterly of 1.75 per cent on the preferred, payable April 1 to stock of record March 18.

St. Joseph Railway, Light, Heat & Power Company; quarterly of 1.25 per cent on the preferred, payable April 1 to stock of record March 16.

Virginia Railway & Power Company; semi-annual of 1.5 per cent, payable April 10 to stock of record March 21.

Washington, Baltimore & Annapolis Electric Railroad; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable March 31 to stockholders of record March 21.

West Indiana Electric Company; the regular quarterly dividend of 1.25 per cent, payable April 1.

West Jersey & Seashore Railroad; the regular semi-annual dividend of 2.5 per cent, payable April 1 to stock of record March 15.

Western Union Telegraph Company; a quarterly dividend of one per cent, putting the stock on a four-per-cent basis. Since 1908 the rate has been three per cent annually. Dividend is payable April 15 to stock of record March 25.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 16.	March 9.
American Tel. & Tel. (New York)	122⅜	120⅞
Commonwealth Edison (Chicago)	138	136¼
Edison Electric Illuminating (Boston)	260½	262
Electric Storage Battery common (Philadelphia)	53½	53⅛
Electric Storage Battery preferred (Philadelphia)	53½	53⅛
General Electric (New York)	147½	146
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1⅛	1
Massachusetts Electric common (Boston	11½	11
Massachusetts Electric preferred (Boston)	62	62
National Carbon common (Chicago)	105½	155
National Carbon preferred (Chicago)	117	115
New England Telephone (Boston)	138	138
Philadelphia Electric (Philadelphia)	26⅞	26¾
Postal Telegraph and Cables common (New York)	84½	84
Postal Telegraph and Cables preferred (New York)	64¾	69
Western Union (New York)	63½	63½
Westinghouse common (New York)	75¼	70¾
Westinghouse preferred (New York)	116¾	116½

PERSONAL MENTION.

MR. MARTIN HOLDEN has been appointed traveling salesman for the Sterling Electric Company, of Minneapolis, Minn., severing his connection with the Electrical Engineering Company.

MR. JOHN F. GREENWALD, of the Mountain States Telephone & Telegraph Company, has been transferred from the public relations department of the company at Helena, Mont., to Salt Lake City.

MR. W. S. COZAD, general traffic superintendent of the Mountain States Telephone & Telegraph Company, with headquarters in Denver, has been in Salt Lake City going over the company's traffic conditions in that state.

MR. ROSS PERRY has entered the employ of the Capital Electric Company, of Salt Lake City, as an electric-sign specialist, and will devote his entire attention to the enlargement of the sign business of this rapidly expanding concern.

MR. WILLIAM L. CUMMISKY has been appointed exclusive sales representative for the Steel City Electric Company, of Pittsburgh, Pa., covering the states of Missouri, Arkansas, Kansas and Oklahoma, with offices at 1117 Olive Street, St. Louis, Mo.

MR. A. B. RICHMOND, secretary of the Olsten Electric Stove Company of Los Angeles, stopped over in Salt Lake City on his way to Boise, where he had been called on business connected with the opening up of a market for their product in that territory.

MR. F. T. TAYLOR, Boston manager of the Cutler-Hammer Manufacturing Company, lectured before the Electrical Association of Wentworth Institute, Boston, March 13, on "Direct-Current and Alternating-Current Electricity." Lantern slides illustrated the lecture.

MR. ARTHUR WALSER, district manager of the small-motor department of the General Electric Company, has transferred his headquarters from Denver, Colo., to Salt Lake City, Utah, on account of the activity in the motor line in the territory served by the Salt Lake City office.

MR. C. R. SIEGEL, division traffic superintendent of the Mountain States Telephone & Telegraph Company, with headquarters at Salt Lake City, has resigned his position and has gone to San Francisco in an effort to improve his health, which has been failing for the past several months.

JOSEPH S. WELLS, general manager of the Utah Light & Railway Company, accompanied by engineers L. L. Dagron and O. A. Honnold, made a trip of inspection last week to Ogden to inspect the company's power dam and pipe line in Ogden Canyon which has recently been raised, enlarged and repaired.

MR. W. N. CASH, manager of the Wisconsin Telephone Company at Beloit, Wis., has been appointed district manager of the Janesville district of this company, succeeding MR. H. J. BENDINGER, resigned. Mr. Cash has had charge of the exchanges at Beloit, Eau Claire and Menomonie during the last 12 years.

MR. L. O. VESER, chief engineer of the Mahoning & Shenango Valley Railway and Light Company, Youngstown, O., has resigned to take effect April 1. He has been in the service of the company since 1909, previous to which time he was connected with various hydroelectric companies in the western states. His home is in Seattle, Wash.

DR. SAMUEL SHELDON will be tendered a testimonial dinner at the Hotel Astor, Saturday, March 21, in recognition of 25 years' of illustrious service and notable achievement as professor in the Polytechnic Institute of Brooklyn. Alumni and undergraduates of the Polytechnic, friends and professional associates, will assemble from all parts of the country to do honor to one of America's foremost educators, scientists and electrical engineers. T. Commerford Martin will preside as toastmaster, and addresses will be made by Dr. Fred W. Atkinson, S. O. Edmonds, William L. Bliss, and Ralph W. Pope.

MR. LELAND HUME, vice-president of the Cumberland Telephone & Telegraph Company, was the principal speaker at a recent meeting of the Louisville (Ky.) Commercial Club, his subject being "Government Ownership of Public Utilities." He expressed himself as being strongly opposed to the proposal of Congressman Lewis, of Maryland, to place telephone and telegraph lines under Federal control, characterizing the idea as "socialistic and fallacious," and declaring that the only ground upon which the Government should ever consider such a plan would be the absolute failure of privately-owned public utilities to come up to reasonable standards of efficiency.

MR. W. S. MURRAY has been appointed by the New York, New Haven & Hartford Railroad Company to be consulting engineer in general charge of all electrical engineering and construction, reporting to President Hustis, with offices at New Haven. Mr. Murray, following the substantial completion of the construction of the system for complete electrical operation west of New Haven, will enter into closer relations with the railroad company. His jurisdiction will hereafter be extended to also include the electrical features of operation in addition to electrical construction. He will continue with the firm of McHenry & Murray in general consulting practice as before.

MR. HUGH L. COOPER has been chosen as a consulting engineer for the Egyptian Government in the construction of a new hydroelectric dam across the Nile. He was selected for the post by Sir Ralph Wilcox, supervising engineering of the famous Assouan dam. Mr. Wilcox was recently in the United States and spent considerable time with Mr. Cooper in inspecting the Keokuk dam. Mr. Cooper has established a reputation as one of the foremost hydroelectric engineering equipment experts in the world. He designed and built the power dam across the Susquehanna River at McCall's Ferry, and he recently completed his operation as construction engineer for the Mississippi River Power Company in building the big Keokuk dam across the Mississippi.

OBITUARY.

MR. HENRY G. PATTERSON, who was for many years connected with the Thomas A. Edison Company, dropped dead at Decatur, Ill., on March 14, of heart trouble. Mr. Patterson installed the first electrical plants in Berlin, Germany, and Milan, Italy, and was well known among electrical engineers throughout the United States. For the past five years he had been connected with the McKinley traction system.

MR. ALDEN E. VILES, treasurer of the Boston Suburban Electric Companies and a director of the Middlesex & Boston Street Railway Company, the Lexington & Boston Street Railway Company and the Norumbega Park Company, died in Boston, March 15, aged 58 years. Mr. Viles was born in Waltham, Mass., and in early manhood was in the real-estate business. He was for two years a member of the Boston City Council. He was at one time president of the University Club in Boston and had membership in the Boston Art Club. His widow, a son and daughter survive.

MR. JOHN GOTT, chief electrician of the Commercial Cable Company, died at Brighton, England, on March 8. Mr. Gott was one of the pioneer submarine cable engineers and was one of the first men to operate the mirror galvanometer for transmitting and receiving cable messages. He was also one of the early operators of the siphon recorder which, until the invention of his new method of receiving cable code signals, was the only practicable manner in which they could be received. About a year ago he perfected an invention by which the Morse method of telegraph signalling could be transmitted in the same manner both over land and under the sea.

MR. S. REED ANTHONY, president and a director of the Manchester (N. H.) Street Railway Company, and treasurer and a director of the Manchester Traction, Light & Power Company and of the Mascoma Light & Power Company, died at his home in Boston, March 10, aged 50 years. Mr. Anthony was a direct descendant of Miles Standish and of John Alden. In early life he was in the employ of Kidder, Peabody & Company, and later organized the banking firm of Tucker, Anthony & Company, which became largely interested in electric railway development in the middle states. More recently the firm has been identified with water-power developments in Minnesota and California. Mr. Anthony was a member of the New York Stock Exchange and a director of the Northwestern Power Company. He belonged to numerous societies.

DATES AHEAD.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Institute of Electrical Engineers. Pittsburgh, Pa., April 9-10. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Chelten Electric Company, Philadelphia, Pa., has recently obtained the approval of the United States Treasury Department on its Chapman type plug and receptacle, catalog No. 5559 for all work under the supervision of that department.

Stow Manufacturing Company, Binghamton, N. J., has issued several bulletins treating of its line of portable electric tools. These bulletins cover radial flexible boring machines, tool-post grinders, electric breast drills and electric bench grinders.

The R. K. Le Blond Machine Tool Company, Cincinnati, O., has issued a bulletin which deals with automatic motor control as applied to Le Blond motor-driven lathes. This well illustrated bulletin enumerates the desirable features of this type of drive.

Hart & Company, Chicago, Ill., are sending out samples of their Red-Cross lubricant for commutators, which has been on the market for a number of years, free upon request. This lubricant is made in a very convenient stick form and is easily applied to a commutator.

Steel City Electric Company, manufacturer of wiring specialties and fittings, announces that it has appointed William L. Cummiskey as its exclusive sales representative in Missouri, Arkansas, Kansas and Oklahoma. Mr. Cummiskey's offices are at 117 Olive Street, St. Louis, Mo.

Allen-Bradley Company, Milwaukee, Wis., has issued a new and well illustrated bulletin (No. B-541), to supersede an earlier publication on resistance starting switches for induction motors. The new bulletin shows many improvements which have been made on type H starters and contains information which is of great importance to those interested in alternating-current motor installations.

The Reynolds Electric Flasher Manufacturing Company, Chicago, Ill., makes the following statement: "All of the legal rights appertaining to Reco color hoods were unqualifiedly sustained by the United States District Court. Southern District of New York, on every point, in a decision rendered by the Honorable Judge Hand, March 10, 1914, in favor of the Reynolds Electric Flasher Manufacturing Company, Chicago and New York."

Mitchell-Rand Manufacturing Company, New York City, has issued a little folder on its "tungsten" carbon brushes and also folders on insulating paints and varnishes, mica products and varnished cloth, and insulation for various purposes. One folder contains samples of varnished silk, cloth and paper, varnished tape, rope, fish and whale-bone, paper, and press board. These samples are of considerable size and the various thicknesses and prices are given.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has issued bulletin No. 3508 on direct-connected exhaust fans and ventilating fan motors for alternating and direct currents. Bulletin No. 3913 just issued describes and illustrates direct-current and alternating-current motors for family sewing machines. Each of these publications clearly sets forth the latest Emerson equipment of each of these classes and replaces former publications now out of date.

Pelouze Manufacturing Company, Chicago, Ill., has just issued some new descriptive matter covering its well known electric heating iron, and combined electric curling iron, hair dryer and waver rod. These products are well and favorably known in the electrical field and have met with a constantly increasing demand. The Pelouze Company is offering an extra inducement to dealers at this time and those interested can learn full particulars by writing the company.

Wagner Electric Manufacturing Company, St. Louis, Mo., has ready a fine new publication designated as bulletin No. 104. It is devoted to Wagner portable instruments and, besides describing the various types of these instruments, it gives over 24 pages of most valuable general notes on electrical testing. A great variety of tests are described and errors likely to arise pointed out. The bulletin, which contains 48 pages, is most liberally illustrated with excellent line cuts and half-tones.

The Esterline Company, Indianapolis, Ind., manufacturer of curve-drawing instruments, announces the opening recently of several additional branch offices as follows: F. C. Morton, Walker Bank Building, Salt Lake City, Utah; G. W. Pieksen, Room D-19, Railway Exchange Building, St. Louis, Mo.; J. S. Black, 908 Hennen Building, New Orleans, La.; W. W. Geisse Company, McKnight Building, Minneapolis, Minn.; General Supplies, Limited, 122 Eleventh Avenue, W., Calgary, Alberta, Canada; G. L. Priest, 229 Sherlock Building, Portland, Oregon. The offices are each equipped with an expert engineering staff, full set of samples, together with all information necessary for promptly taking care of any questions that may arise in connection with the sale or use of graphic instruments.

The Electric Controller & Manufacturing Company, Cleveland, Ohio, has issued a reprint of an article by H. F. Stratton, entitled, "Application of Electric Power in the Foundry." This paper considers the control and operation of many foundry machines, considerable attention being paid to the uses and control of lifting magnets and safety features for cranes. Bulletin No. 1037, entitled "Type B Limit Stop for Direct-Current Motors," has recently been issued. This stop is designed to prevent overtravel of electric cranes, door hoists and other motor-driven machines. Its construction is fully described, several illustrations being included. Bulletin No. 1038 describes form H dynamic-braking dinkey controllers for direct-current motors. This controller is a modification of the standard-dinkey-ventilated controller in combination with two magnetic switches. The bulletin, which is illustrated, gives the details of the device.

Record of Electrical Patents.

Issued by the United States Patent Office, March 10, 1914.

1,089,394. Call-Recording System for Telephone Exchanges. E. E. Clement, assignor to Telephone Improvement Co., Attica, N. Y. The recording outfit includes a special motor-driven selector switch and printing mechanism for a semi-automatic telephone system.

1,089,401. Load Brake. E. H. Dewson, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrical means governed by the load on the car for controlling the adjustment of the brake.

1,089,404. Fire-Alarm Signal-Box for Automatic Telephone Systems. J. Erickson, assignor to Denio General Electric Co., Rochester, N. Y. The calling mechanism is arranged so it may dispatch alarm-recording impulses.

1,089,414. Automatic Trolley-Pole Controller. M. B. Jolliffe, New Haven, Conn., assignor of one-third each to J. V. Ryder and J. H. Meeks. An emergency valve for a compressed-air-operated trolley is automatically opened when the current is broken by the jumping of the trolley wheel from the wire.

1,089,415. Device for Supporting Trolley-Wires. C. de Kandó, assignor to G. Westinghouse, Pittsburgh, Pa. A steadying device for catenary trolley wires.

1,089,426. Translating and Registering Apparatus. E. C. Molina, assignor to American Telephone & Telegraph Co. A telephone switching system with selecting apparatus, a set of dec-

imal keys, a register mechanism with corresponding terminals connected to the keys and a movable member co-operating therewith.

1,089,434. Relay Apparatus. A. Orling, assignor to Orling's Telegraph Instruments Syndicate, Ltd., London, England. For a siphon recorder.

1,089,461. Jump-Spark Ignition Apparratus for Internal-Combustion Engines. M. B. Crist, assignor to Colonial Trust Co., Pittsburgh, Pa. A high-tension oil-insulated and cooled coil.

1,089,466. Moving-Picture Machine. F. H. Frude, Chicago, Ill., assignor of one-third to S. I. Levin. A motor-driven machine with circuit-breaker opening the motor circuit on breakage of the film.

1,089,478. Explosion Motor. A. T. Kasley, assignor to Colonial Trust Co., Pittsburgh, Pa. Has an electric motor for operating the air and gas valves and means for varying the gas valve as the calorific value of the gas varies.

1,089,479. Cable-Telegraph System. I. Kitsee, assignor to American Telephone & Telegraph Co. At each end of a high-capacity cable are two sources, one of high and the other of low E.M.F., the sources at opposite ends opposing each other.

1,089,490. Electrolier Fitting. C. Messick, Hackensack, N. J. A pull switch is secured at the bottom of the central shell.

1,089,497. Electrolier-Hanger. L. C. Reed, New Orleans, La. A special hickey construction. (See cut.)

1,089,534. Differential-Microphone Repeater. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. A cup partially inclosing the magnet has a cap carrying a diaphragm and a microphone transmitter.

1,089,540. Lamp-Ignition Device. L. M. Dull, Los Angeles, Cal. Has stationary and movable contacts carried by an insulating tube.

1,089,549. Storage-Battery System. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Generator and load conductors are independently secured to the battery terminals so that they cannot become connected if separated from the battery terminal.

1,089,564. Circuit-Controller. S. P. Hull, Yonkers, N. Y. Includes a bar with a T-shaped slot into which engages the head of a T bolt.

1,089,589. Electric Indicator. C. Schenck and J. M. Graham, assignors to Elevator Supply & Repair Co., Chicago, Ill. A solenoid-operated annunciator.

1,089,597. Squirrel-Cage Rotor. F. W. Stefater, assignor to Jas. Clark, Jr., Electric Co., Louisville, Ky. Has a groove at each end cutting through the ends of the bars and the intermediate portions of the corresponding end ring in alternation, and a locking ring in the groove holding the parts together.

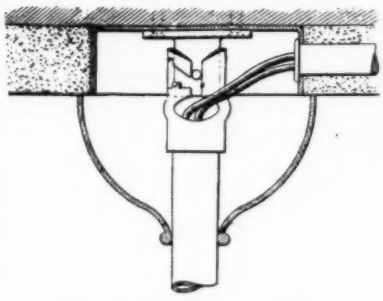
1,089,609. Electrical Fixture. E. S. White, Mount Carmel, Ill. To a shower pan is secured a globular body with side recesses for an opened loop to support the lighting fixture.

1,089,624. Safety Attachment for Water-Heating Apparatus. J. F. Cunningham, Springfield, Mo. An electric alarm.

1,089,642. Support for Electric Conductors. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Notched insulating disks hold the conductors evenly spaced around a guide rod.

1,089,658. Electrically Driven Planing-Machine. G. E. Mason, Toronto, Canada. Motor-generator set and special controller to permit adjusting speed and length of cutting and return strokes.

1,089,659. System of Control. H. Maxwell, assignor to General Electric Co. A synchronous motor is arranged



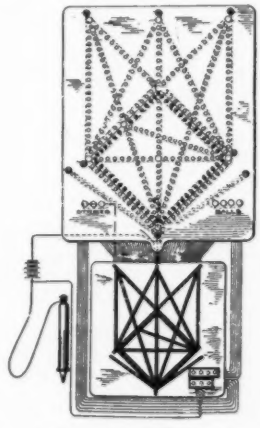
1,089,497.—Electrolier Hickey.

to have its exciting circuit opened by a polarized overload relay.

1,089,673. Telephone Cutoff. R. J. Robison, Romulus, Okla. Associated with the switchhook of a party-line telephone.

1,089,680. Cigarette-Making Machine. R. A. Sloan and J. E. Lloyd Barnes, Liverpool, England. Includes an electrically controlled weighing device.

1,089,684. Wire Cable. J. B. Stone, Fresno, Cal. An electric cable consisting of series of relatively thin metal strips, each twisted to auger-like form



1,089,798.—Electric Score-Board.

and lying side by side with only their edges in contact.

1,089,700. Current Collector and Process of Making the Same. E. G. Gilson, assignor to General Electric Co. A pigtail is connected to molded metal brush by imbedding the unbraided end of a stranded conductor in finely divided brush material containing some oxide, then compressing and firing in a vacuum.

1,089,744. Recording Instrument. R. P. Brown, Philadelphia, Pa. A clock-controlled electrically operated chart recorder.

1,089,749. Electric Lamp. H. A. Douglas, Chicago, Ill. An automobile headlight with special connecting plug.

1,089,750. Reflecting Electric Lamp. H. A. Douglas. Has special means for holding the housing, lamp socket and reflector together.

1,089,757. Tungsten Manufacture. T. W. Frech, Jr., assignor to General Electric Co. Process of reducing tungsten oxide and drawing tungsten for lamp filaments employing a compound of thorium.

1,089,759. Filament Mounting. E. S. Gardner, assignor to General Electric Co. Method of supporting incandescent lamp filament including use of a number of alternating long and short filament carriers mounted on supporting stem.

1,089,763. Signal Apparatus for Mines. A. J. Gurney, Herrin, Ill. An electrical signaling system controlled by the hoisting cage.

1,089,771. Binding-Post. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Spindle with locking shoulder holds terminal and prevents its withdrawal without separation of clamping members.

1,089,773. Method of Making Titanium and Other Alloys. E. Kraus, assignor to General Electric Co. Process of producing fused ingot of metal utilizing the heat generated electrically by the introduction of reducing metals into the fusion.

1,089,778. Electric Transportation System. C. B. McLeer and J. F. McLeer, Brooklyn, N. Y., assignors to Electric Carrier Co. Motor members mounted on ribs on opposite sides of passageways co-operate with motor members on carrier to produce motion.

1,089,783. Electric-Motor Drive. K. A. Pauly, assignor to General Electric Co. In combination, a plurality of motors, means for causing the speed of one motor to depend upon its load, means for reversing the motors, and means for causing them to have different relative speeds after reversal.

1,089,785. Electric Switch. W. G. Peet, assignor to Bryant Electric Co., Bridgeport, Conn. For a pull-chain socket.

1,089,786. Method of Working Refractory Metals. Marcello von Pirani, assignor to General Electric Co. The process of reclaiming refractory metal which has become cracked during rolling which consists of electrically locally heating the same in an inert atmosphere.

1,089,787. Intermediate Support for Bond-Wires and Nut-Locks. W. M. Post, Elizabeth, N. J. A combined nut-locking and wire-retaining washer formed of a single piece of spring metal having a curved wire-retaining portion and a nut-engaging element.

1,089,798. Electric Score-Board. C. H. Smith, Worcester, Mass. A baseball score-board with electrical means for controlling same. (See cut.)

1,089,806. Liquid-Mixer. J. J. Wood, assignor to General Electric Co. Driven by a vertical-shaft electric motor.

1,089,814. Testing System and Mechanism for Electrical Circuits. C. E. Beach and H. W. Doughty, assignors to G. O. Knapp, New York, N. Y. Includes means for testing electrical circuits.

1,089,815. Alternating-Current Motor. A. C. Bell and T. R. Bell, Westfield, N. J. Includes a reversible motor having a commutator and controlling apparatus.

1,089,820. Control of Electrically Operated Switches. E. R. Carichoff, assignor to General Electric Co. A relay mechanism including switch contacts and a magnet for opening each of the contacts.

1,089,825. Telephone Transmission-Circuits. H. C. Egerton, assignor to Western Electric Co. Includes means of rendering articulation in one of two nearby receivers practically inaudible.

1,089,850. Switch Control. S. A. McConnell and B. Erickson, Portland, Ore. Includes an oscillating switch lever and an accurate member having stops for a depending pin.

1,089,884. Manifold-Heater. E. A. Vollbrecht, Detroit, Mich. Includes electric heating coils.

1,089,886. Electric Apparatus for Driving Clocks or Similar Mechanism. H. E. Warren, Ashland, Mass. Includes electrical means for giving impulse to the pendulum.

1,089,907. Electrical Contact. W. D. Coolidge, assignor to General Electric Co. An electrical make-and-break contact of tungsten.

1,089,919. Alternating-Current-Controlling Apparatus. E. L. Gale, Sr., assignor to Otis Elevator Co. Jersey City, N. J. Includes electromagnetic means for controlling and reversing induction motors.

1,089,920. Current-Controlling Apparatus. E. L. Gale, Sr., assignor to Otis Elevator Co. Includes means for controlling a resistance in series with the motor armature and an extra field permanently connected across the resistance.

1,089,921. Electrical Controlling Apparatus. E. L. Gale, Sr., assignor to Otis Elevator Co. Includes a switch-controlled electromagnetic brake.

1,089,937. Electric Elevator. C. B. Manville, assignor to Otis Elevator Co. Includes a normally shunted safety switch and means associated with a landing door for opening the shunt upon opening a landing door.

1,089,950. Direction-Indicating Signal. J. J. O'Connell, Rochester, N. Y. Includes electromagnetic means for controlling shutters in front of electric signal lamps.

1,089,951. Process and High-Pressure Furnace for the Direct Production of Iron and Steel. C. Otto, Dresden, Germany. Includes use of electrical resistances.

1,089,957. Trolley for Trackless Vehicles. W. B. Potter, assignor to General Electric Co. Includes a ball mounted on the trolley pole, a head comprising two blocks containing bearings for the ball, a tapered fin on the upper block, and contact shoes on opposite sides of the fin and extending to or below the horizontal plane of ball.

1,089,968. Trolley Attachment. F. A. Schmedinghoff, Kansas City, Mo. A trolley harp having an extended axle supporting rollers on each side of the trolley wheel.

1,089,982. Lighting Device for Ovens. A. Susslin, Gulfport, Miss. Includes use of incandescent lamp and controlling device.

1,089,990. Sterilizer. P. G. Triquet, Paris, France. Includes mercury-arc lamps and baffles.

1,089,993. Magnetic Separator. G. Ullrich, assignor to Fried. Krupp Aktiengesellschaft, Grusonwerk, Magdeburg-Buckau, Germany. A separator employing stationary and rotating magnetic poles.

1,089,995. Electric Generating Device for Railway Trains. J. Venge, Milwaukee, Wis.. A governor device for fluid motor of head-end train-lighting systems.

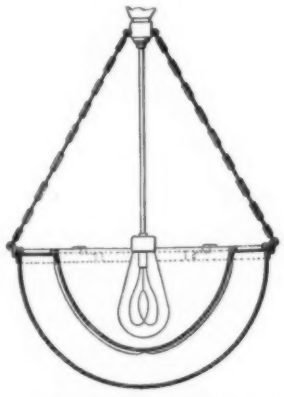
1,090,016. Speed - Limiting Device for Turbo-Generators. F. R. C. Boyd, assignor to General Electric Co. A fan arrangement with movable blades actuated by centrifugal force.

1,090,044. System for Treating Liquids With Ozone. M. Fuss, assignor to General Electric Co. Includes an electric ozonizer.

1,090,048. Continuous-Current Generator. K. Greuner, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Includes a main magnet-frame carrying a compounding winding and a separate magnet-frame carrying a differential winding, the saturation point of the last-named magnet-frame being considerably lower than that of the former.

1,090,053. Telephone-Locking Device. J. W. Harvey, Sunset, Tex. A mechanical device for locking the receiver arm of desk telephones.

1,090,076. Illuminating Appliance. V. R. Lansingh, New York, N. Y. A semi-indirect fixture with an upwardly facing translucent reflector surrounding the source and an upwardly facing diffusing bowl surrounding the reflector, the annular space between the bowl and reflector edges being closed. (See cut.)



1,090,076.—Semi-Indirect Fixture.

1,090,107. Electric Furnace. S. Peacock, Chicago, Ill. Includes use of a number of electrodes and means for adjusting one of them.

1,090,109. Means for Starting Motor Road-Vehicles. F. R. Simms, London, Eng. A combined ignition and lighting dynamo with means for connecting the lighting armature with an exterior source of current, whereby it may be employed as a motor for starting the engine.

1,090,111. Manufacture of Electric Filaments. C. Auer von Welsbach, Vienna, Austria Hungary. Consists in chemically treating a solution containing a salt of osmium and a salt of a refractory-oxide metal, highly heating the resultant precipitate in a reducing atmosphere and finally forming the mass into filaments.

1,090,118. Supporting Means for Swinging Objects. A. E. Rittenhouse, assignor to A. E. Rittenhouse Co., Honeoye Falls, N. Y. A motor-driven toy aeroplane suspended by electrical conductors.

Patents Expired.

The following United States electrical patents expired March 16, 1914.

578,707. Controlling Mechanism for Electric Motors. F. R. Bacon, Milwaukee, Wis.

578,710. Storage Battery. C. T. Barrett, Brooklyn, N. Y.

578,716. Telegraph Firehose. J. Buchtel, Portland, Ore.

578,750. Circuit-Breaker. H. P. Kelly, Philadelphia, Pa.

578,771. Cutout and Agitator for Dust-Transmitters for Telephones. S. B. Rawson, Elyria, O.

578,823. Charging Secondary Batteries. I. Kitsee, Philadelphia, Pa.

578,825. Insulator. H. H. Luscomb, Hartford, Conn.

578,829. Railbond for Electric Railways. T. J. McTighe, Brooklyn, N. Y.

578,840. Railway-Crossing Signal. C. Selden, Baltimore, Md.

578,853. Arrangement for Closing or Opening Bars at Railroad Crossings. H. Biermann, Breslau, Gremany.

578,867. Electric Battery. H. N. Farley, Warwick, N. Y.

578,870. Active Mass for Electric Accumulators. S. Hammacher, Berlin, Germany.

578,887. Paste for Electric Accumulators. R. Linde, Berlin, Germany.

578,893. Burglar Alarm. M. P. McDermott, Auckland, New Zealand.

578,925. Electropneumatic Organ Action. F. H. Hastings and F. J. Flaherty, Weston, Mass.

578,939. Electric Carrier Apparatus. H. M. Neer, Springfield, O.

578,954. Electrical Controlling Apparatus. B. C. Van Emon, San Francisco, Cal.

578,976. Electric Clock-Setting Mechanism. C. M. Crook, Elgin, Ill.

578,981. Lightning Arrester. W. K. Freeman, Fort Wayne, Ind.

578,984. Temperature-Controlling Apparatus. S. Green, New York, N. Y.

578,992. Multiplex Telephony. S. W. Holman, Boston, Mass.

578,997. Repeater. C. W. Leiser, Carlinville, Ill.

579,001. Battery. S. J. Martin, Detroit, Mich.

579,003. Telephone Transmitter. W. J. Moore, Elmer, Mich.

579,012. Dynamo-Electric Machine. G. A. Scheeffer, Peoria, Ill.

579,024. Electric Elevator. S. D. Strohm, Philadelphia, Pa.

579,028. Controller for Dynamo-Electric Machines. C. E. Woods, Chicago, Ill.

579,032. Electric Arc Lamp. T. E. Adams, Cleveland, O.

579,036. Telephone-Switchboard Plug. F. E. Bossong, Watseka, Ill.

579,051. Means for Protecting Electric Machines From Heat. J. P. B. Fiske, Alliance, O.

579,059. Construction and Regulation of Electric Machines. T. H. Hicks, Detroit, Mich,

579,062. Electric Motor and Dynamo. W. S. Horry, Gloucester City, N. J.

579,063. Regulator for Electric Motors. R. M. Hunter, Philadelphia, Pa.

579,075. Electric Call and Call-Answering Apparatus. E. H. Owen, C. N. Williams and F. H. Donaldson, Garvanza, Cal.

579,079. Electricity Meter. A. Raps, Berlin, Germany.